ICOM

SERVICE MANUAL

VHF AIR BAND TRANSCEIVER

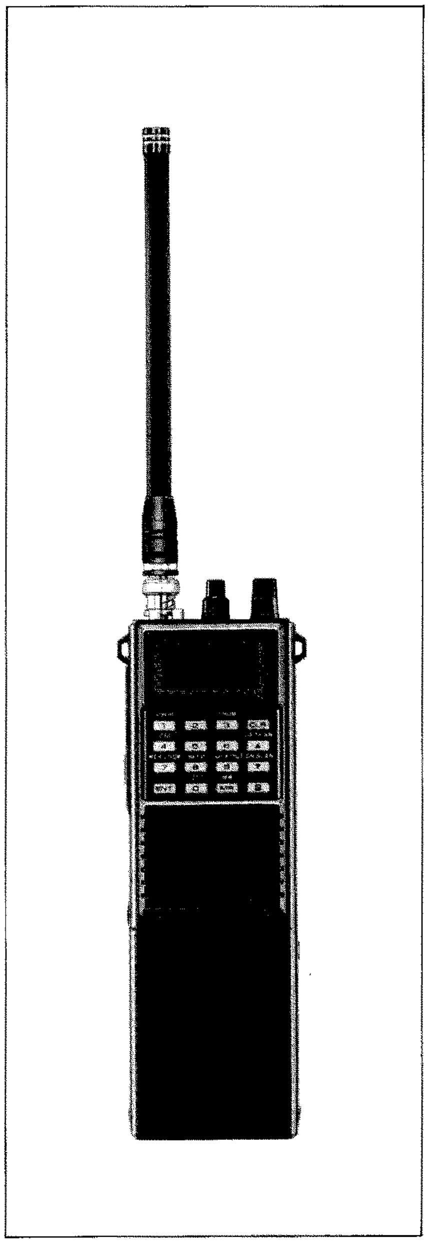
IC-A20MKII

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-A20MKII** VHF AIR BAND TRANSCEIVER at the time of publication.

MODEL	VERSION NUMBER	VERSION	SYMBOL
IC-A20 MKII	#03	United Kingdom	UK
IC-A20F MKII	#04	France	FRA
IC-A20 MKII	#05	Europe	EUR
IC-A20 MKII	#06	Germany	FRG



DANGER

NEVER connect the transceiver to an AC outlet or to a DC power supply that uses more than 15 V. This will ruin the transceiver.
DO NOT expose the transceiver to rain, snow or any liquids.
DO NOT reverse the polarities of the power supply when connecting the transceiver.
DO NOT apply an RF signal of more than 20 dBm (100 mW) to the antenna connector. This could damage the transceiver's front end.

ORDERING PARTS

Be sure to include the following four points when ordering replacement parts:
1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

<SAMPLE ORDER>

1110002440	IC	µPC1313HA	IC-A20MKII	MAIN UNIT	5 pieces
8810000100	Screw	PH M2 × 4 ZK	IC-A20MKII	CHASSIS UNIT	10 pieces

Addresses are provided on the inside back cover for your convenience.

REPAIR NOTE

1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 30 dB~40 dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.

TABLE OF CONTENTS

SECTION 1 SPECIFICATIONS

GENERAL

• Frequency coverage	:	Transmit Communications 118.000～136.975 MHz Navigation 108.000～117.975 MHz Receive Communications 118.000～136.975 MHz
• Mode	:	AM (6K00A3E)
• Number of memory channels	:	20
• Tuning step	:	25 kHz
• Frequency stability	:	±0.002 % (−10 °C～+50 °C)
• Antenna impedance	:	50 Ω (unbalanced)
• Power supply requirement	:	12～15 V DC (Negative ground)
• Usable temperature range	:	−10 °C～+50 °C
• Current drain (at 13.2 V DC)	:	Transmit High 900 mA Low 600 mA Receive Max. audio output 400 mA Squelched 55 mA
• Dimensions (with CM-7G)	:	65 (W)×198 (H)×35 (D) mm; 2.6 (W)×7.8 (H)×1.4 (D) in (Projections not included)
• Weight (with CM-7G)	:	640 g (1.4 lb)

TRANSMITTER

• Output power (at 13.2 V DC) :

	PEP power	Carrier power
High	5.0 W	1.5 W
Low	1.6 W	500 mW

• Modulation system	:	Low level modulation
• Microphone impedance	:	1 kΩ
• Spurious emissions	:	−50 dB

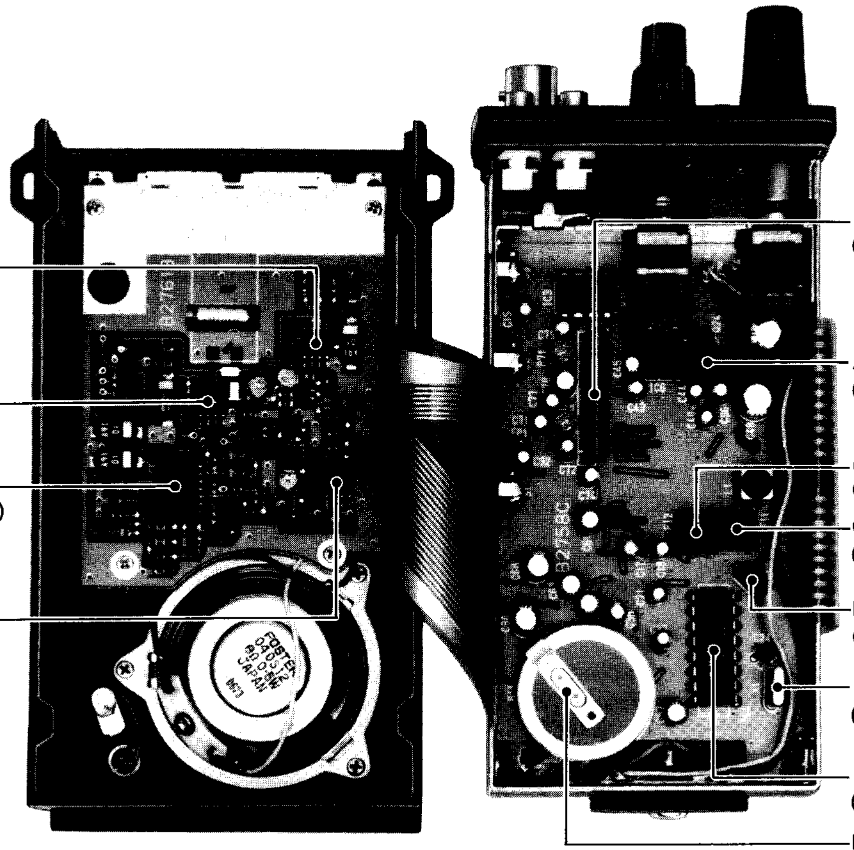
RECEIVER

• Receive system	:	Double-conversion superheterodyne
• Sensitivity	:	1.0 µV for 6 dB S/N (with 1 kHz, 30 % modulation)
• Squelch sensitivity (threshold)	:	0.25 µV
• Intermediate frequencies	:	1st 35.8 MHz 2nd 455 kHz
• Audio output power	:	600 mW with an 8 Ω load
• Audio output impedance	:	8 Ω
• Spurious response rejection	:	−60 dB
• Noise and hum	:	25 dB

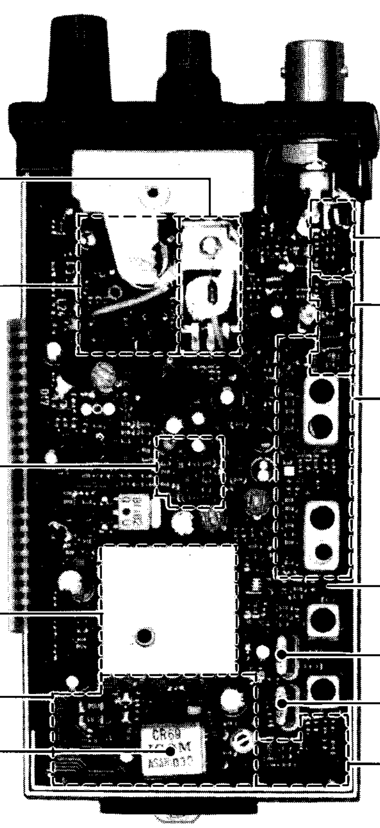
All stated specifications are subject to change without notice or obligation.

SECTION 2 INSIDE VIEWS

• **VOR UNIT** • **MAIN UNIT**



• **RF UNIT**



SECTION 3 CIRCUIT DESCRIPTION

3-1 RECEIVER CIRCUITS

3-1-1 ANTENNA SWITCHING CIRCUIT (RF UNIT)

The antenna switching circuit functions as a low-pass filter while transmitting and as a resonator circuit while receiving.

Receive signals enter the RF UNIT from the antenna connector (J2001) and pass through a Chebyschev low-pass filter (C2001~C2005, L2001, L2002). The antenna switching circuit employs a λ /4-type diode switching system. While receiving, D2001 and D2002 turn OFF, and the received signals which are applied to the RF circuit pass through a low-pass filter (C2007~C2010, L2003, L2004).

3-1-2 RF CIRCUIT (RF UNIT)

The signals pass through a bandpass filter (C2012~C2015, D2003, D2004, L2005, L2006) and are then amplified at an RF amplifier (Q2002). The received signals are applied to a bandpass filter (C2021~C2023, D2005, D2006, L2007, L2008).

D2003~D2006 are varactor diodes and are controlled by the PLL lock voltage. The voltage is current-amplified at Q2023 and is then applied to the varactor diodes. These varactor diodes tune the center frequency of an RF passband for wide bandwidth receiving and good image response rejection.

3-1-3 1st MIXER AND 1st IF CIRCUITS (RF UNIT)

The signals from the bandpass filter are mixed with a 1st LO signal from the VCO UNIT and are converted to a 35.8 MHz 1st IF signal. The 1st IF signal is applied to a pair of crystal filters (FI2001) to suppress out-of-band signals and is then amplified at the 1st IF amplifier (Q2004).

3-1-4 2nd LO AND 2nd MIXER CIRCUITS (MAIN UNIT)

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal.

The 1st IF signal from the 1st IF circuit is applied to the 2nd mixer section of IC1004 (pin 16) and is mixed with a 2nd LO signal for conversion to a 455 kHz 2nd IF signal.

IC1004 contains the 2nd LO, 2nd mixer, limiter, quadrature detector and noise amplifier circuits. The 2nd LO circuit section in IC1004 and X1001 generate a 35.345 MHz 2nd LO signal.

To suppress unwanted heterodyned frequency signals, the 2nd IF signal from the 2nd mixer section of IC1004 (pin 3) is applied to the ceramic filter (FL1001 or FL1002).

FL1001 is for the communication band; FL1002 is for the navigation band and allows a VOR signal that is modulated by a 9960 Hz signal to pass through to the 2nd IF amplifiers (Q1001, Q1002).

Depending on whether the communication band or navigation band is in use, the CPU (IC3001) selects either filter (FL1001 or FL1002) using the filter selector circuit (D1001, D1002, Q1004).

On the navigation band, Q1006 turns OFF and Q1004 turns ON, and the 2nd IF signal passes through FL1002. On the communication band, Q1006 turns ON and Q1004 turns OFF, and the 2nd IF signal passes though FL1001.

3-1-5 AM DETECTOR CIRCUIT (RF UNIT)

The AM detector circuit demodulates an AM signal on the communication band and navigation band.

The amplified signal from Q1002 is detected at the AM detector (D1003) for conversion to an AF signal.

RECEIVER CIRCUIT BLOCK DIAGRAM

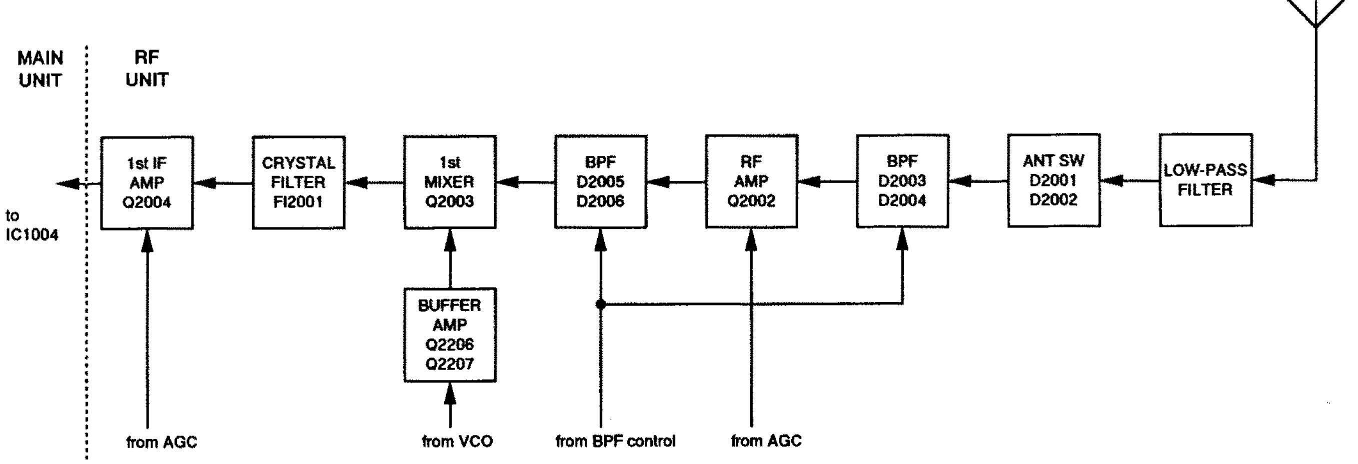


Fig. 3-1

3-1-6 SQUELCH CIRCUIT (MAIN UNIT)

The squelch circuit cuts out AF signals when no RF signal is received.

Detected signals are applied to the limiter amplifier and noise amplifier sections (IC1004, pin 5). The noise components from IC1004 (pin 9) pass through the [SQL] control (R1035) and are then rectified by the noise detector (D1006) and are converted to DC voltage. The DC voltage controls the squelch control circuit (Q1008~Q1010).

3-1-7 AGC CIRCUIT (MAIN AND RF UNITS)

The AGC (Automatic Gain Control) circuit reduces signal fading and keeps the audio output level constant.

When receiving a strong signal, the AM detector voltage increases, and the collector voltages of Q1003 and Q2005 decrease. When the collector voltage of Q1003 decreases, base bias voltages of the 2nd IF amplifiers (Q1001, Q1002) decrease.

When the collector voltage of Q2005 decreases, base bias voltages of the 1st IF amplifier (Q2004) and RF amplifier (Q2002) decrease. Thus, total gain is decreased and protected from distortion.

When receiving a VOR signal, a 30 Hz sine wave is detected. To prevent the AGC function from operating with the 30 Hz sine wave, Q1005 turns ON and C1018 is connected in parallel with C1017.

3-1-8 AF CIRCUIT (MAIN UNIT)

The AF circuit drives the speaker (SP3001).

The AF signal selected at IC1005 is amplified at the AF preamplifier (Q1011) and is applied to a low-pass filter (Q1012). Through the [VOL] control (R1035), the AF signal is amplified at the AF power amplifier (IC1006). IC1006 drives the speaker (SP3001).

3-1-9 ANL CIRCUIT (MAIN UNIT)

The ANL (Automatic Noise Limiter) circuit (D1004, C1015, R1019~1022) reduces pulse noises.

The AM detector output signal (DETO) from D1003 is applied to the cathode of D1004 passing through R1019, where it is divided by R1019 and R1020. The DETO signal is also applied to the anode of D1004, passing through R1022 and R1021.

When the [ANL] switch (S1201) is OFF, the anode voltage of D1004 is higher than the cathode voltage. Thus, the received signal passes through D1004 and is applied to the AF selector (IC1005).

When the [ANL] switch is ON, C1015 is grounded. The detector output, including pulse noises, is applied to the cathode of D1004 only. If pulse noises are received, the cathode voltage of D1004 becomes higher than the anode voltage and D1004 turns OFF. Thus, while pulse noises are received, the detected signal is not applied to IC1005.

ANL CIRCUIT

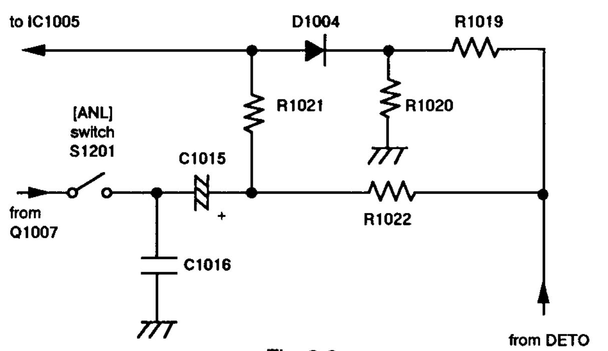


Fig. 3-3

SQUELCH CIRCUIT

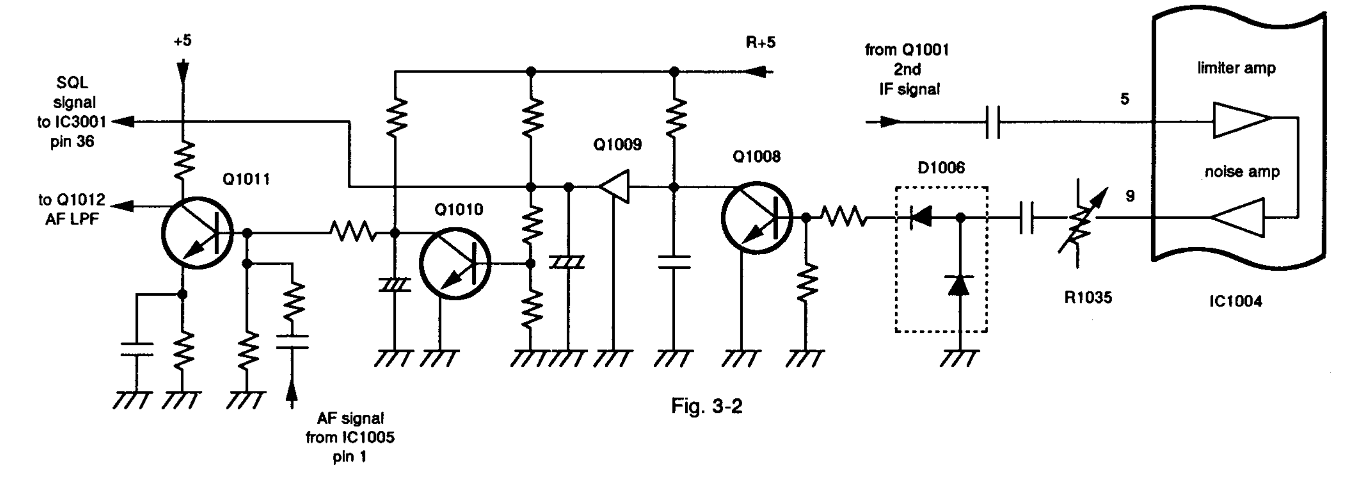


Fig. 3-2

3-1-10 VOR CIRCUIT (VOR UNIT)

From the AF signal, the VOR circuit detects a variable signal (VORC) and reference signal (VORS) from a VOR station. The VOR circuit sends these signals to the CPU (IC3001).

When the transceiver is set in the navigation band (108~117.975 MHz), the NAV signal (IC3001, pin 48) becomes "LOW," turning the VOR circuit ON via Q4004. Q4004 controls a 5 V power source for the VOR UNIT.

The signal from the AM detector (DETO) is buffer amplified at the VOR amplifier (IC4001(B)).

The DETO signal includes 30 Hz variable phase components and 9960 Hz reference phase components.

The 30 Hz component passes through the 30 Hz bandpass filter (IC4001(D)) and is converted to a square wave signal at the VORC comparator (IC4004(A)). The square wave signal is then applied to IC3001 (pin 44) as a variable signal (VORC).

The 9960 Hz component passes through the 10 kHz bandpass filter (IC4001(C)). These components are FM modulated with 480 Hz deviation and 30 Hz modulation.

Signals are then amplified at a limiter amplifier (IC4002(A)) and are detected at an FM detector (IC4002(B)) to obtain a 30 Hz reference signal.

The 30 Hz signal is amplified at IC4003(A). This signal is passed through the 30 Hz bandpass filter (IC4003(B)) and is converted to a square wave signal at the VORS comparator (IC4004(B)). This signal is applied to IC3001 (pin 42) as a reference signal (VORS).

A portion of output from IC4001(C) is applied to the VOR sensor (Q4001~Q4003). When the VOR signal is received, Q4003 turns ON and IC3001 (pin 43) receives "LOW" to display the course deviation needle.

IC4001(A) applies the bias voltage fixed by R4008, R4009 to each IC.

VOR CIRCUIT BLOCK DIAGRAM

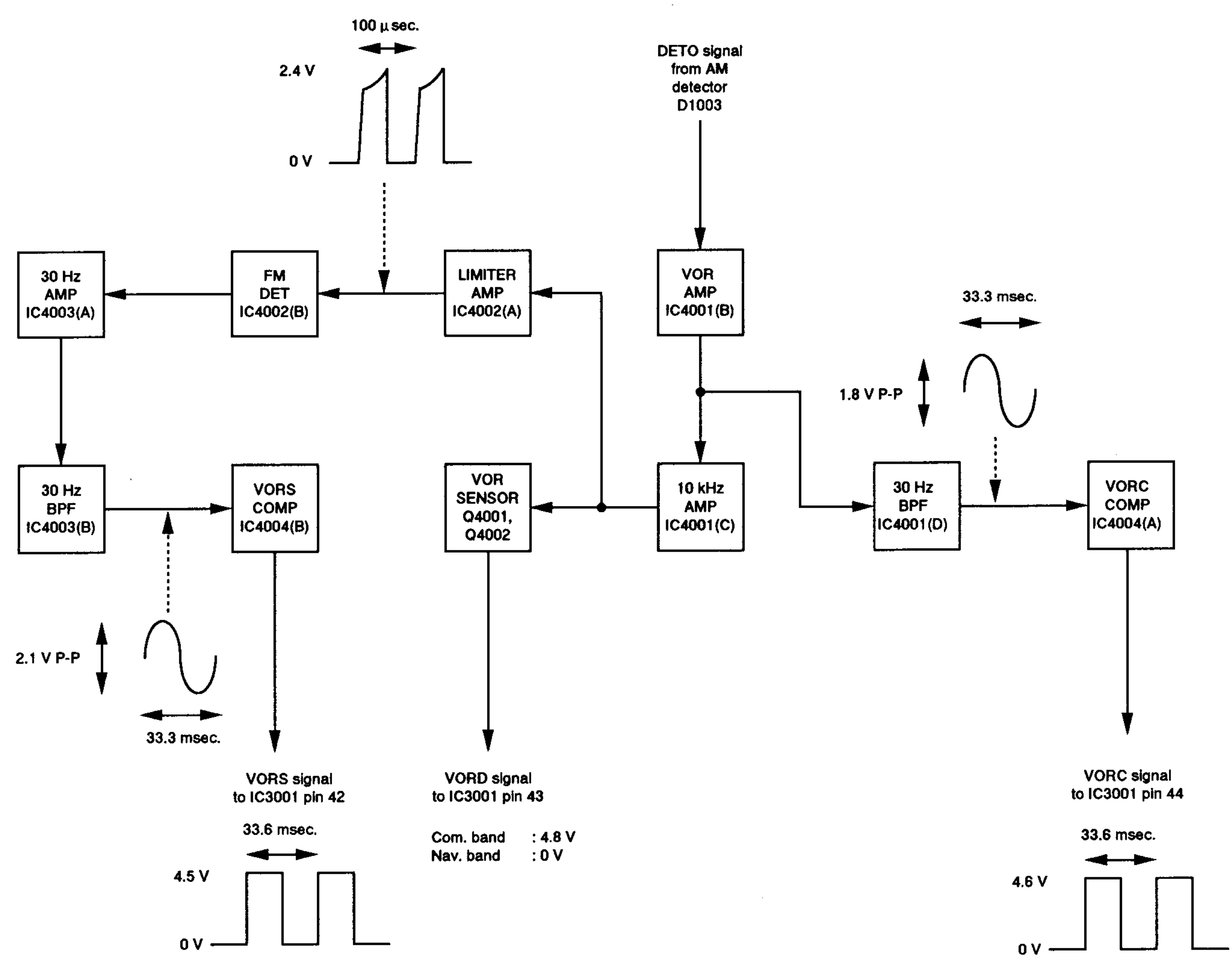


Fig. 3-4

3-2 TRANSMITTER CIRCUITS

3-2-1 MICROPHONE AMPLIFIER AND ALC CIRCUITS (MAIN UNIT)

The microphone amplifier circuit provides an AF signal for AM modulation.

AF signals from the microphone (MC3001) or from the [MIC] jack (J2002) are applied to the AF amplifier (IC1001, pin 2) through R1067. R1067 adjusts the microphone input level.

The output signal from IC1001 (pin 3) passes through R1071, a buffer amplifier (IC1003, pin 6), and a low-pass filter (IC1003, pin 3). The signal (MOD) is applied to the AM modulator (Q2022) on the RF UNIT.

The ALC (Automatic Level Controller) prevents signal distortion caused by strong input signals. A portion of the output signals from the AF amplifier (IC1001, pin 3) is detected by the ALC detector (D1013). The detected voltage is applied to the amplifier (IC1001, pin 4) and controls the gain of IC1001.

3-2-2 MODULATOR CIRCUIT (RF UNIT)

Using an AF signal from the microphone amplifier circuit, the modulator circuit modulates an LO signal from the VCO.

During transmission, the LO signal from OUT1 of the VCO UNIT is output through D2011 and an attenuator (R2034~R2036). This signal is then applied to the AM modulator (Q2022).

Q2022 amplifies the LO signal with a gain controlled by an AF signal (MOD) to make low level modulation.

3-2-3 PRE-DRIVE AND DRIVE AMPLIFIERS (RF UNIT)

The modulated RF signal from Q2022 is amplified at the APC (Automatic Power Control) amplifier (Q2021), pre-drive amplifier (Q2020) and drive amplifier (Q2019). The drive amplifier outputs approx. 1 W (PEP).

By using troidal coils (L2018, L2020, L2022) as matching transformers between these stages, signals over a wide frequency range can be amplified without adjustment.

3-2-4 RF POWER AMPLIFIER AND APC CIRCUITS (RF UNIT)

From 118 MHz to 136.975 MHz, the RF power amplifier gives 5 W (PEP) of output power.

The amplified signal from the drive amplifier (Q2019) is power-amplified at the RF power amplifier (Q2018). While transmitting, the antenna switching circuit (D2012, D2021) is turned ON and the signals are applied to the antenna connector through a low-pass filter (C2001~C2005, L2001, L2002).

The APC (Automatic Power Control) circuit (D2013, D2014, Q2021) protects the RF power amplifier (Q2018) from a mismatched output load.

MICROPHONE AMPLIFIER AND MODULATOR CIRCUITS

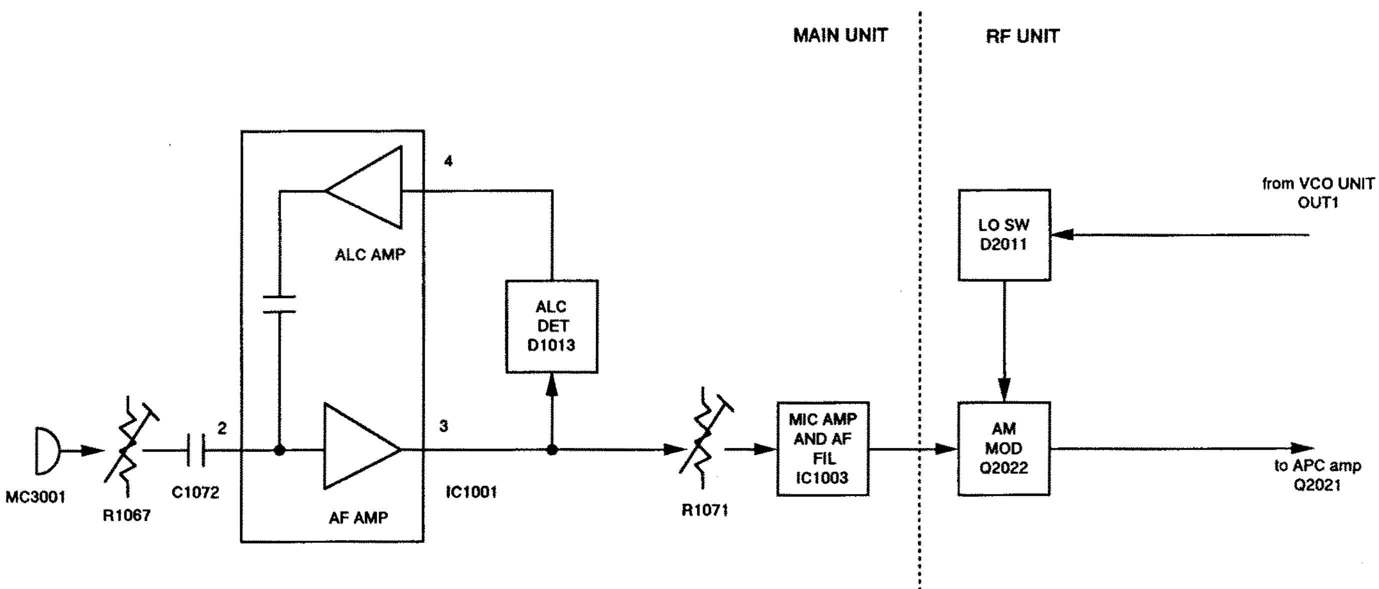


Fig. 3-5

3-3 PLL CIRCUITS

3-3-1 GENERAL (RF UNIT)

The PLL circuit is designed in a way that allows the desired frequency to be changed directly by the VCO without a prescaler by using a high-speed PLL IC (IC2001).

3-3-2 REFERENCE OSCILLATOR (RF UNIT)

To obtain a 25 kHz reference frequency, a 12.8 MHz signal generated by the reference oscillator section of IC2001 and X2001 is divided by 512 at the divider section of IC2001.

3-3-3 VCO CIRCUIT (VCO UNIT)

The VCO (Q2201, Q2202) employs a Colpitts oscillator circuit. Frequency shifting for transmitting and receiving is performed by changing the bias voltage of D2201.

Signals generated at the VCO are output as OUT1 and OUT2. The OUT2 signal is applied to the PLL IC (IC2001, pin 8), and the OUT1 signal is applied to the AM modulator (Q2022) or 1st mixer (Q2003).

3-3-4 PROGRAMMABLE DIVIDER (RF UNIT)

The output signal from OUT2 of the VCO UNIT is applied to the divider (IC2001, pin 8) and divided N times at the programmable counter section of IC2001. The output signal from the programmable counter is applied to the phase detector section of IC2001 and is phase compared.

The output signal from the phase detector is output from pin 5.

N data is the number of times the desired frequency is divided by the 25 kHz reference frequency. The desired frequency is the transmit frequency while transmitting and the 1st LO frequency while receiving.

$$\text{N data} = \frac{\text{Desired frequency}}{\text{Reference frequency}}$$

The signal passes through a charge pump (Q2012, Q2013, Q2014) and a lag lead-type loop filter (R2032, R2033, C2056). It is then applied to the VCO UNIT as lock voltage (LV).

The output voltage from the charge pump is also applied to the BPF control circuit (D2008, D2019, Q2023) to change the center frequency of the receiver bandpass filters.

3-3-5 UNLOCK CIRCUIT (RF UNIT)

When the PLL circuit is unlocked, the phase detector (IC2001, pin 7) becomes "LOW," turning the unlock sensor (Q2010, Q2011) ON via the time constant circuit (R2030, C2050). Q2011 sends an unlock signal to the CPU (IC3001, pin 35).

PLL CIRCUIT BLOCK DIAGRAM

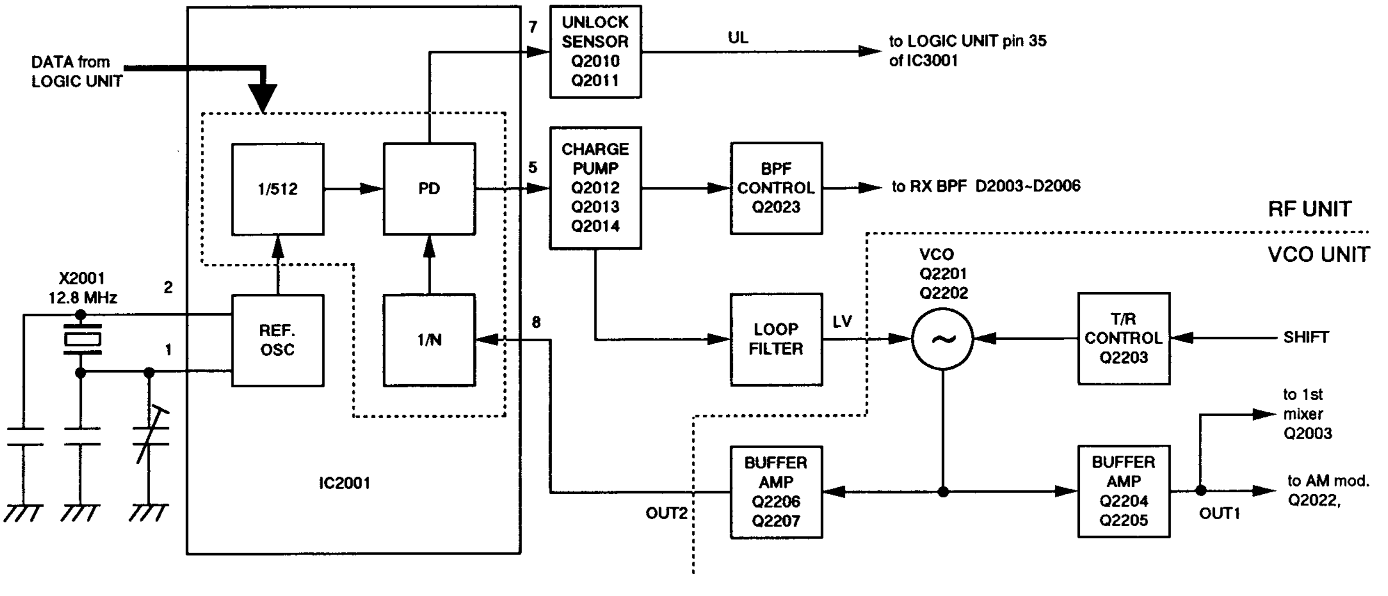


Fig. 3-6

3-4 POWER SUPPLY CIRCUITS

3-4-1 INTERNAL/EXTERNAL POWER SWITCHING CIRCUIT (MAIN UNIT)

When using a battery pack, the relay (RL1001) is OFF and the [VOL] control (R1035) is connected to the battery pack.

When 13.2 V DC is connected to the [DC IN] jack (J2003), RL1001 turns ON and R1035 is connected to J2003. In case of reverse polarity, D1007 is reversely biased, preventing RL1001 from turning ON and protecting the transceiver.

3-4-2 VOLTAGE LINES

	Description
Vcc	A voltage line from a battery pack or the [DC 13.8V] jack.
+5V	A common 5 V line from the +5V regulator (D1010, Q1013, Q1014).
+5	A 5 V line from the +5 regulator (D1009, Q1015, Q1016).
T+5	A 5 V line from the T+5 regulator (D2010, Q2015~Q2017). Used for the transmit circuit.
R+5	A 5 V line from the R+5 regulator (D1008, Q1017~Q1019). Used for the receive circuit.
CPU5	Power source for the CPU. Refer to 3-4-5 below.

3-4-3 AF POWER AMPLIFIER POWER SOURCE (MAIN UNIT)

The voltage circuit (Q1023, Q1024) provides 9 V for the AF power amplifier.

3-4-4 POWER SOURCE CIRCUIT FOR OPTION (RF UNIT)

The current limiter circuit (Q2009, D2009, R2024, R2025, C2047, C2048) provides approx. 5 V to an option connected to the [MIC] jack (J2002).

3-4-5 REDUCED VOLTAGE DETECTOR CIRCUIT (MAIN UNIT)

The CPU (IC3001 on LOGIC UNIT) memorizes operating frequencies and other settings. While the power is ON, the +5 line is applied to IC3001 (pins 54, 55, 57) through D1014.

While the power is OFF, approx. 3 V is applied to IC3001 from the lithium battery (BT1001) through D1014 to preserve memory contents.

CPU5 LINE

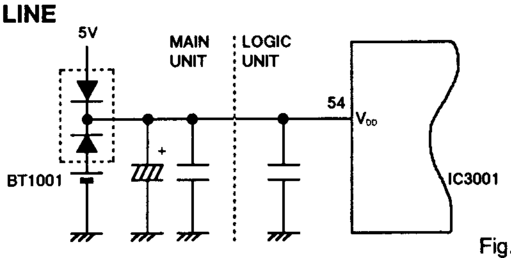


Fig. 3-7

3-5 CPU PORT ALLOCATIONS

Following are CPU explanations and I/O ports.

Pin No.	Port	Active HIGH or LOW	Description
29~32	KIS0~KIS3		Input port for the key matrix.
34	PTT	HIGH	When the PTT switch is pushed, this port becomes "HIGH."
35	UL	HIGH	When the PLL circuit is unlocked, this port becomes "HIGH."
36	SQL	LOW	When the squelch opens, this port becomes "LOW."
37	LIGHTI	LOW	When the [LIGHT] switch is pushed, this port becomes "LOW."
39	CK		Output port for the PLL serial data clock.
40	DATA		Output port for the PLL serial data.
42	VORS	_⌐‾	When a VOR signal is received, this port becomes "HIGH." Input port for the VOR reference signal.
43	VORD	LOW	When a VOR signal is received, this port becomes "LOW."
44	VORC	_⌐‾	Input port for the VOR variable signal.
45	BATT	HIGH	When this port is "HIGH," the low battery indicator appears.
46	SHIFT	HIGH	When transmitting, to shift the VCO oscillation frequency, this port becomes "HIGH."
47	WX	HIGH	When the navigation band is selected, this port becomes "HIGH."
48	NAV	HIGH	When a weather channel is selected, this port becomes "HIGH."
49	BEEP		Outputs beep tones.
50	PLLSTB		Output port for the strobe signal of PLL serial data.
51	TMUT	HIGH	When transmission is inhibited, this port becomes "HIGH."
52	TRC	HIGH	When transmitting, this port becomes "HIGH."
53	LIGHTO	HIGH	When this port is "HIGH," the function display is illuminated.
60	UP	‾¬_	Input port for the up signal of the tuning knob.
61	DN	‾¬_	Input port for the down signal of the tuning knob.
62~63	KOI0~KOI1		Output ports for the initial matrix.
64~67	KOK0~KOK3		Output ports for the key matrix.

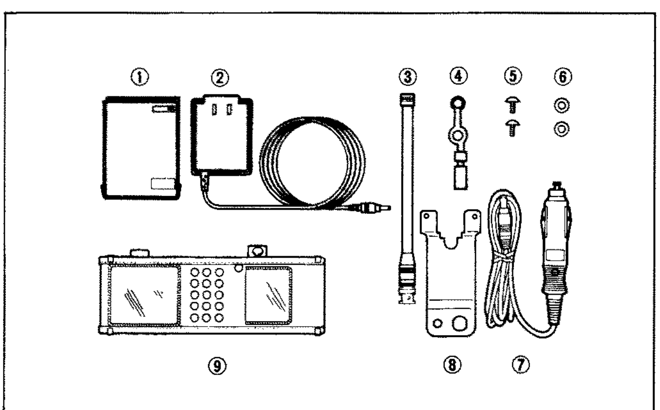
SECTION 4 MECHANICAL PARTS AND DISASSEMBLY

• CHASSIS PARTS

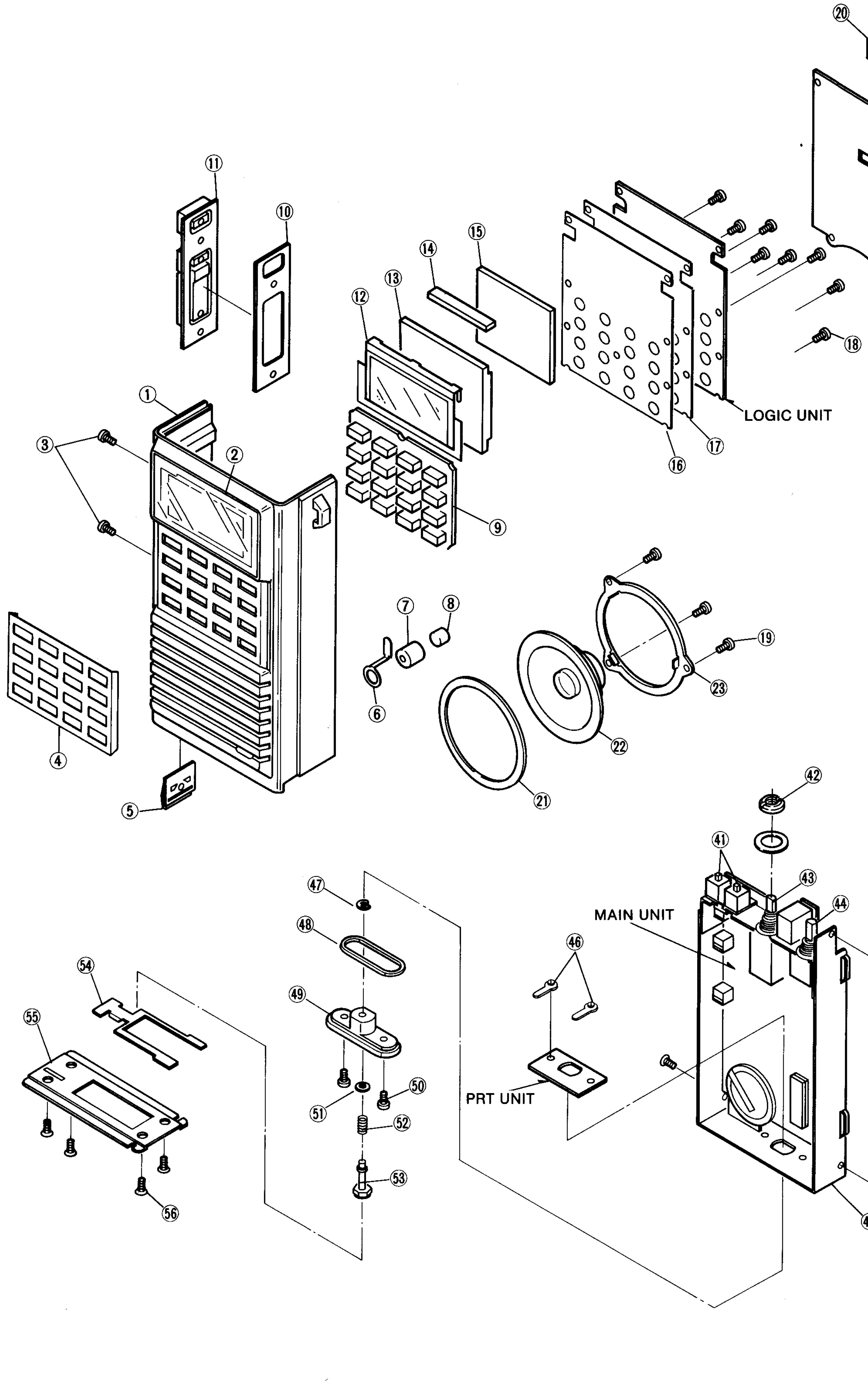
LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
1	8210006080	562 Front panel (A)-1	1
2	8310014720	562 Window plate (B)-1 (UK, EUR, FRG)	1
	8310014730	562 Window plate (C)-1 (FRA)	1
3	8810000530	Screw PH No.0 M2×5 ZK	2
4	8930021520	562 Keyboard plate (C)	1
5	8930005780	Release button	1
6	8930007210	297 Microphone lug	1
7	8930001630	Microphone holder	1
8	7700000480	Microphone KUC2023-01-006	1
9	8010010680	562 Keyboard (D)-1	1
10	8930001090	PTT seal plate	1
11	8930003660	PTT Water resistant seal (A)	1
12	8930011060	562 LCD holder	1
13	5030000680	LCD FSD-8E96 [FUNCTION DISPLAY]	1
14	8930011050	LCD contact SRCN-562 SG type	2
15	6910002060	Reflector ALF40×20×0.58	1
16	8510006980	862 LOGIC shield plate	1
17	8930019840	862 LOGIC insulating seal	1
18	8810006560	Screw PH B0 No. 0 M1.4×3.5	10
19	8810004800	Screw PH B0 No. 0 M2×4	7
20	8930011020	562 Grounding plate	1
21	8930002930	Speaker seal	1
22	2510000540	Speaker T040S12A0000	1
23	8930019620	862 Speaker plate	1
24	8610006680	Knob N159 [VOL]	1
25	8610006700	Knob N158 [SQL]	1
26	8610006690	Knob N160 [DIAL]	1
27	6510000300	Antenna connector BNC-RM-106	1
28	8210006420	Top panel (B)-1	1
29	8810000100	Screw PH M2×4 ZK	2
30	8930019440	Knob seal	2
31	8610000130	Button K30 R [ANL]	1
32	8610000120	Button K30 G [HIGH/LOW]	1
33	8930006050	SW seal	1
34	8930002940	Top ring	1
35	6450000220	Connector HEC0747-01-010 [13.8 V DC IN]	1
36	6450000130	Connector HSJ1102-01-540 [MIC]	1
37	6450000220	Connector HEC0747-01-010 [SP]	1
38	8810006460	Screw FH M2×3	4
39	8010010490	U-chassis	1
40	6910000710	BNC Grounding lug	1
41	2230000250	Switch SPPH22014A [ANL, HIGH/LOW]	2
42	8830000550	VR nut (E)	2
43	7210001900	Variable resistor RV-198 [VOL, SQL]	1
44	2260001410	Switch SW-119 [DIAL]	1
45	8010010500	L-chassis	1
46	8860000020	Screw lug M2.6	2
47	8860000300	E ring M2	1
48	8930002780	O ring (E)	1
49	8010002740	Contact holder	1
50	8810001840	Screw PH M2.6×6 NI	2
51	8930002790	O ring (F)	1
52	8930007220	Spring (A)-1	1
53	6510000630	+ Contact	1
54	8930005612	Battery pack latch	1
55	8010002880	Sliding guide (A)	1
56	8810002380	Screw FH M2.6×6 NI BS	4
57	8930020350	862 Rear shield plate	1
58	8930002950	Panel seal-1	1
59	8810000740	Screw PH A M2×15 ZK	4
60	8010006334	Rear panel (A)-6	1

Screw abbreviations B0: Self-tapping screw PH: Pan head FH: Flat head BS: Brass NI: Nickel ZK: Black

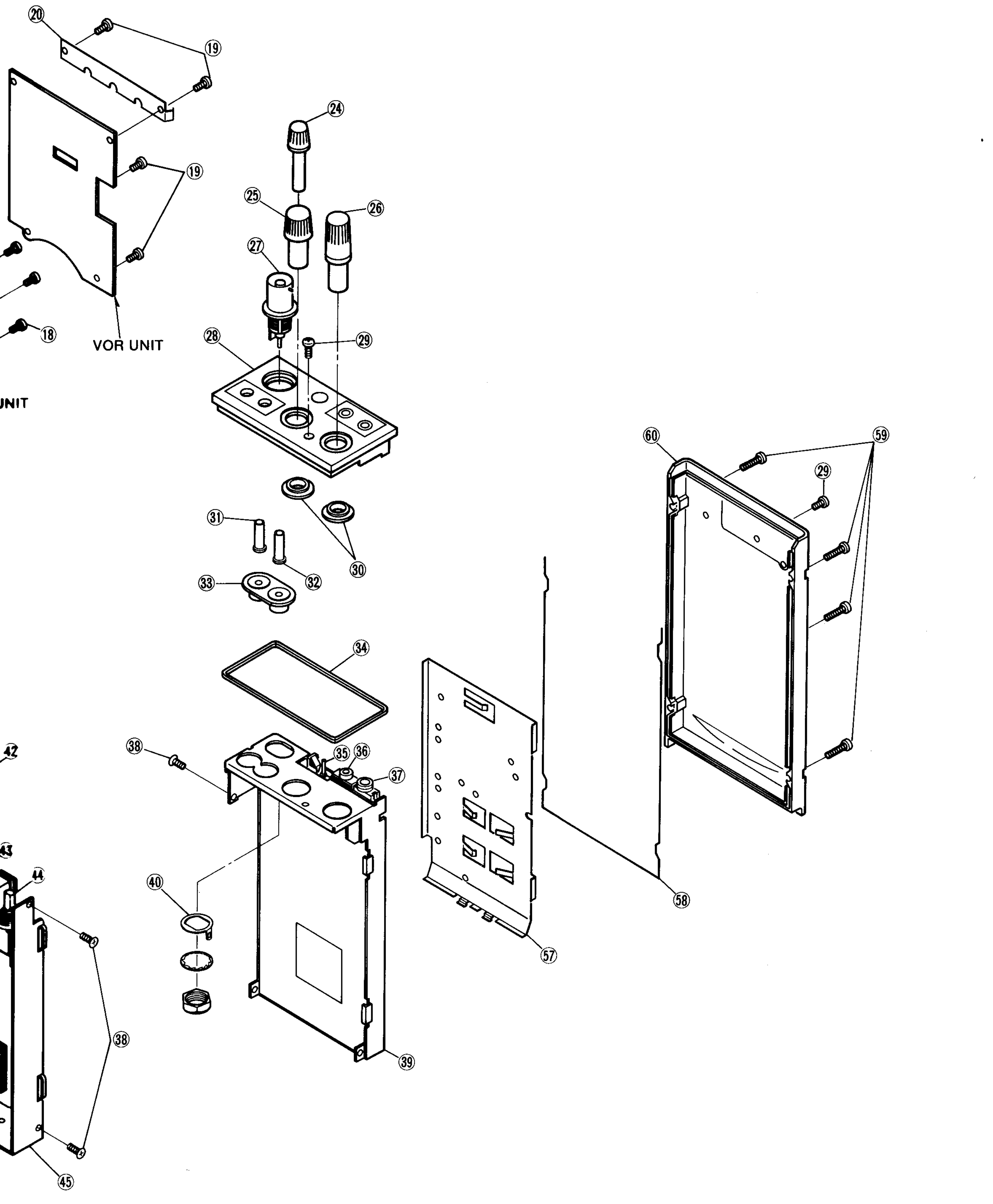
• ACCESSORIES



LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
1	Optional product	CM-7G	1
2	Optional product	CM-16E (UK, FRA, EUR)	1
		CM-17 (FRG)	1
3	Optional product	EX-208-6	1
4	8930013960	Rubber cap (A)	1
5	8810003650	Icom screw A4	2
6	8850000640	Washer-B M3	2
7	Optional product	CM-1	1
8	8930005660	Belt clip	1
9	Optional product	LC-74	1



LOGIC UNIT
MAIN UNIT
PRT UNIT



VOR UNIT
UNIT

SECTION 5 PARTS LIST

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC3001	1140001920	IC	μPD75308GF-A25-3B 9
IC3002	1110001550	IC	S-8054ALB-LM-T1
IC3003	1130003920	IC	TC4S69F (TE85R)
Q3001	1530002060	Transistor	2SC4081 T107 R
Q3002	1510000510	Transistor	2SA1576 T107 R
Q3003	1530002060	Transistor	2SC4081 T107 R
Q3004	1530002060	Transistor	2SC4081 T107 R
Q3005	1590000430	Transistor	DTC144EU T107
Q3006	1590000650	Transistor	DTA144TU T107
D3001	1750000120	Diode	DWA010-TE
D3002	1790000590	Diode	MA110 (TW)
D3003	1790000590	Diode	MA110 (TW)
D3005	1790000590	Diode	MA110 (TW)
D3006	1750000120	Diode	DWA010-TE
D3007	1790000590	Diode	MA110 (TW)
D3008	1750000160	Diode	DA114 T107
D3011	1750000160	Diode	DA114 T107
X3001	6050007390	Crystal	CR-331
R3001	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3002	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3003	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3004	7410000570	Resistor Array	EXB-V8V 474J
R3008	7410000570	Resistor Array	EXB-V8V 474J
R3012	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R3013	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R3014	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R3015	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R3016	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R3017	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3018	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R3019	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R3020	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3021	7030003800	Resistor	ERJ3GEYJ 105 V (1 MΩ)
R3022	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3023	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R3024	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R3025	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3026	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R3027	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R3028	7030003690	Resistor	ERJ3GEYJ 124 V (120 kΩ)
R3029	7030003740	Resistor	ERJ3GEYJ 334 V (330 kΩ)
R3030	7030003800	Resistor	ERJ3GEYJ 105 V (1 MΩ)
R3031	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3032	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R3033	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
C3001	4030006630	Ceramic	C1608 SL 1H 150J-T-A
C3002	4030006630	Ceramic	C1608 SL 1H 150J-T-A
C3003	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C3004	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C3005	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C3007	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3008	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3009	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3010	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3011	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3012	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3013	4030006850	Ceramic	C1608 JB 1H 471K-T-
C3014	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3015	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3016	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C3017	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C3018	4030006710	Ceramic	C1608 SL 1H 470J-T-A

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C3019	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3020	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3021	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3022	4030006850	Ceramic	C1608 JB 1H 471K-T-A
DS3001	5010000070	LED	LT1E73A
DS3002	5010000070	LED	LT1E73A
DS3003	5010000070	LED	LT1E73A
DS3004	5010000070	LED	LT1E73A
DS3005	5040001260	LED	LN01301C (Q)
DS3006	5040001260	LED	LN01301C (Q)
DS3007	5030000680	LCD	FSD-8E96
SP3001	2510000540	Speaker	T040S12A0000
EP3001	0910030341	P.C. Board	B-3073A (LOGIC)
EP3002	0910015361	F.P.C. Board	B-1464A

[VOR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC4001	1110001340	IC	NJM3403AM
IC4002	1120000430	IC	LA6393M-TP-T1
IC4003	1110001240	IC	μPC358G2-T1
IC4004	1120000430	IC	LA6393M-TP-T1
Q4001	1530002060	Transistor	2SC4081 T107 R
Q4002	1530002060	Transistor	2SC4081 T107 R
Q4003	1590000510	Transistor	RN1409 (TE85R)
Q4004	1590000470	Transistor	RN2403 (TE85R)
D4001	1160000060	Diode	DAN202U T107
R4001	7030003730	Resistor	ERJ3GEYJ 274 V (270 kΩ)
R4002	7030003590	Resistor	ERJ3GEYJ 183 V (18 kΩ)
R4003	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R4004	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R4005	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R4006	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R4007	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R4008	7030003590	Resistor	ERJ3GEYJ 183 V (18 kΩ)
R4009	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R4010	7030003570	Resistor	ERJ3GEYJ 123 V (12 kΩ)
R4011	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R4012	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R4013	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R4014	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R4015	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R4016	7030003580	Resistor	ERJ3GEYJ 153 V (15 kΩ)
R4017	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R4018	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R4019	7310002760	Trimmer	RV-152 (RH03 A3AJ4X0HA)223
R4020	7310002800	Trimmer	RV-156 (RH03 A3AJ5J)224
R4021	7030003590	Resistor	ERJ3GEYJ 183 V (18 kΩ)
R4022	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R4023	7030003590	Resistor	ERJ3GEYJ 183 V (18 kΩ)

[VOR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R4024	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R4025	7310002600	Trimmer	RV-110 (RH03 A3AS4X0AA)473
R4026	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R4027	7030003740	Resistor	ERJ3GEYJ 334 V (330 kΩ)
R4028	7030003750	Resistor	ERJ3GEYJ 394 V (390 kΩ)
R4029	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R4030	7030003540	Resistor	ERJ3GEYJ 682 V (6.8 kΩ)
R4031	7510000400	Thermistor	DTN-T203K103LS (T)
C4001	4550000530	Tantalum	TESVA 1V 104M1-8L
C4002	4550002950	Tantalum	TESVA 0J 335M1-8L
C4003	4550000530	Tantalum	TESVA 1V 104M1-8L
C4004	4550000530	Tantalum	TESVA 1V 104M1-8L
C4005	4550000770	Tantalum	TESVC 0J 226M-12L
C4006	4550000450	Tantalum	TESVC 1C 106M-12L
C4007	4550000460	Tantalum	TESVA 1C 105M1-8L
C4008	4550000450	Tantalum	TESVC 1C 106M-12L
C4009	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C4010	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C4011	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C4012	4550000530	Tantalum	TESVA 1V 104M1-8L
C4013	4550000530	Tantalum	TESVA 1V 104M1-8L
C4014	4550000450	Tantalum	TESVC 1C 106M-12L
C4015	4550000530	Tantalum	TESVA 1V 104M1-8L
C4016	4030006870	Ceramic	C1608 JB 1H 222K-T-A
C4017	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C4018	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C4019	4030008960	Ceramic	C2012 JB 1C 104K-T-A
EP4001	0910027932	P.C. Board	B-2761B (VOR)
EP4002	0910015371	F.P.C. Board	B-1478A

[SW UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
S1201	2230000250	Switch	SPPH22014A [ANL]
S1202	2230000250	Switch	SPPH22014A [HIGH/LOW]
EP1201	0910031250	P.C. Board	B-2762 (SW)

[PRT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C1301	4010000500	Ceramic	DD104 B 102K 50V
C1302	4010000500	Ceramic	DD104 B 102K 50V
EP1301	0910031260	P.C. Board	B-2763 (PRT)

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1001	1110002440	IC	μ PC1313HA
IC1002	1180000530	IC	S-81250HG-RD-T1
IC1003	1110000070	IC	μ PC358C
IC1004	1110002160	IC	MC3372P
IC1005	1130005640	IC	TC4W53F (TE12L)
IC1006	1110002330	IC	TA7368P
Q1001	1530002600	Transistor	2SC4215-O (TE85R)
Q1002	1530002600	Transistor	2SC4215-O (TE85R)
Q1003	1530002060	Transistor	2SC4081 T107 R
Q1004	1590000660	Transistor	DTC144TU T107
Q1005	1590000660	Transistor	DTC144TU T107
Q1006	1590000430	Transistor	DTC144EU T107
Q1007	1590000660	Transistor	DTC144TU T107
Q1008	1530002060	Transistor	2SC4081 T107 R
Q1009	1590000430	Transistor	DTC144EU T107
Q1010	1530002060	Transistor	2SC4081 T107 R
Q1011	1530002060	Transistor	2SC4081 T107 R
Q1012	1530002060	Transistor	2SC4081 T107 R
Q1013	1530002060	Transistor	2SC4081 T107 R
Q1014	1510000510	Transistor	2SA1576 T107 R
Q1015	1530002060	Transistor	2SC4081 T107 R
Q1016	1520000200	Transistor	2SB798-T2 DK
Q1017	1530002060	Transistor	2SC4081 T107 R
Q1018	1520000200	Transistor	2SB798-T2 DK
Q1019	1590000650	Transistor	DTA144TU T107
Q1020	1590000660	Transistor	DTC144TU T107
Q1021	1590000650	Transistor	DTA144TU T107
Q1022	1510000510	Transistor	2SA1576 T107 R
Q1023	1530002060	Transistor	2SC4081 T107 R
Q1024	1520000080	Transistor	2SB909M R
D1001	1790000450	Diode	MA862 (TX)
D1002	1790000450	Diode	MA862 (TX)
D1003	1790000900	Diode	ND411G-1-T2
D1004	1790000590	Diode	MA110 (TW)
D1005	1790000590	Diode	MA110 (TW)
D1006	1750000070	Diode	1SS226 (TE85R)
D1007	1790000590	Diode	MA110 (TW)
D1008	1790000590	Diode	MA110 (TW)
D1009	1790000590	Diode	MA110 (TW)
D1010	1790000590	Diode	MA110 (TW)
D1011	1790000590	Diode	MA110 (TW)
D1012	1790000590	Diode	MA110 (TW)
D1013	1790000490	Diode	HSM88AS-TR
D1014	1160000060	Diode	DAN202U T107
X1001	6050003830	Crystal	CR-190
X1002	6070000080	Discriminator	CDBM455C16
FI1001	2020000590	Ceramic Filter	CFUM455D
FI1002	2020000580	Ceramic Filter	CFUM455B
L1001	6150002770	Coil	LS-293
R1001	7030003430	Resistor	ERJ3GEYJ 821 V (820 Ω)
R1002	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R1003	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1004	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1005	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1006	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1007	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1009	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1010	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1011	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R1012	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1013	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R1014	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R1015	7030003700	Resistor	ERJ3GEYJ 154 V (150 kΩ)
R1016	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R1017	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R1018	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1019	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R1020	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1021	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1022	7030003740	Resistor	ERJ3GEYJ 334 V (330 kΩ)
R1023	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1024	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1025	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R1026	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R1027	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
R1028	7030003470	Resistor	ERJ3GEYJ 182 V (1.8 kΩ)
R1029	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1030	7030003540	Resistor	ERJ3GEYJ 682 V (6.8 kΩ)
R1031	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R1032	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R1033	7030003530	Resistor	ERJ3GEYJ 562 V (5.6 kΩ)
R1034	7030003740	Resistor	ERJ3GEYJ 334 V (330 kΩ)
R1035	7210001900	Variable Resistor	RV-198 (RK097221100U0) 10KB/10KA
R1036	7030003610	Resistor	ERJ3GEYJ 273 V (27 kΩ)
R1037	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1038	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R1039	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1040	7030003570	Resistor	ERJ3GEYJ 123 V (12 kΩ)
R1041	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
R1042	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1043	7030003700	Resistor	ERJ3GEYJ 154 V (150 kΩ)
R1044	7030003610	Resistor	ERJ3GEYJ 273 V (27 kΩ)
R1045	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1046	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1047	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R1048	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R1049	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R1050	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R1051	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R1053	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R1054	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R1055	7030003340	Resistor	ERJ3GEYJ 151 V (150 Ω)
R1056	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R1057	7030003420	Resistor	ERJ3GEYJ 681 V (680 Ω)
R1058	7030003200	Resistor	ERJ3GEYJ 100 V (10 Ω)
R1059	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R1060	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R1061	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R1062	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R1063	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R1064	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R1065	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R1066	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R1067	4610001010	Trimmer	EVMLGGA00B23 (202)
R1068	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R1069	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R1070	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R1071	4610001230	Trimmer	EVMLGGA00B14 (103)
R1072	7030003660	Resistor	ERJ3GEYJ 683 V (68 kΩ)
R1073	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R1074	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R1075	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R1076	7030003740	Resistor	ERJ3GEYJ 334 V (330 kΩ)
R1077	7030003660	Resistor	ERJ3GEYJ 683 V (68 kΩ)
R1078	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1079	7030003800	Resistor	ERJ3GEYJ 105 V (1 MΩ)
R1080	7030003660	Resistor	ERJ3GEYJ 683 V (68 kΩ)
R1081	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R1082	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R1083	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R1084	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R1085	7030003590	Resistor	ERJ3GEYJ 183 V (18 kΩ)
C1001	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C1002	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1003	4030006690	Ceramic	C1608 SL 1H 330J-T-A
C1004	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1005	4030006880	Ceramic	C1608 JB 1H 472K-T-A
C1006	4030006880	Ceramic	C1608 JB 1H 472K-T-A
C1007	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C1008	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C1009	4030006860	Ceramic	C1608 JB 1H 102K-T-A

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C1010	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C1011	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C1012	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C1013	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C1014	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C1015	4510001440	Electrolytic	50 MS5 R22 μF
C1016	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1017	4510001460	Electrolytic	50 MS5 R47 μF
C1018	4510001820	Electrolytic	10 MS5 10 μF (D=3.0)
C1019	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1020	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1021	4510001820	Electrolytic	10 MS5 10 μF (D=3.0)
C1021	4510001820	Electrolytic	10 MS5 10 μF (D=3.0)
C1022	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C1023	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C1024	4550000330	Tantalum	ECSF 0J E106
C1025	4030008960	Ceramic	C2012 JB 1C 104K-T-A
C1026	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C1027	4030006690	Ceramic	C1608 SL 1H 330J-T-A
C1028	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1029	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1030	4030008650	Ceramic	C1608 JB 1H 332K-T-A
C1031	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1032	4030006690	Ceramic	C1608 SL 1H 330J-T-A
C1033	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1034	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1035	4030008920	Ceramic	C1608 JB 1C 473K-T-A
C1036	4030006880	Ceramic	C1608 JB 1H 472K-T-A
C1037	4510001850	Electrolytic	16 MS5 4R7 μF
C1038	4510001480	Electrolytic	50 MS5 2R2 μF
C1039	4030008470	Ceramic	C1608 JB 1H 272K-T-A
C1040	4510001820	Electrolytic	10 MS5 10 μF (D=3.0)
C1040	4510001820	Electrolytic	10 MS5 10 μF (D=3.0)
C1041	4030006870	Ceramic	C1608 JB 1H 222K-T-A
C1042	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1043	4510001470	Electrolytic	50 MS5 1 μF
C1044	4510001820	Electrolytic	10 MS5 10 μF (D=3.0)
C1045	4510001460	Electrolytic	50 MS5 R47 μF
C1046	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C1047	4550001040	Tantalum	DN 1C 3R3M
C1048	4510001330	Electrolytic	6R3 MS5 100 μF
C1049	4030008920	Ceramic	C1608 JB 1C 473K-T-A
C1050	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C1051	4510001860	Electrolytic	16 MS5 33 μF
C1052	4030008920	Ceramic	C1608 JB 1C 473K-T-A
C1053	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1054	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1055	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1056	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1057	4510001310	Electrolytic	6R3 MS5 22 μF
C1058	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1059	4550001910	Tantalum	DN 0J 220M
C1060	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1061	4510001310	Electrolytic	6R3 MS5 22 μF
C1062	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1063	4510001310	Electrolytic	6R3 MS5 22 μF
C1064	4510001310	Electrolytic	6R3 MS5 22 μF
C1065	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1066	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1067	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1068	4510001360	Electrolytic	16 MS5 22 μF
C1069	4030008960	Ceramic	C2012 JB 1C 104K-T-A
C1070	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1071	4510001850	Electrolytic	16 MS5 4R7 μF
C1072	4510001470	Electrolytic	50 MS5 1 μF
C1073	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1074	4510001850	Electrolytic	16 MS5 4R7 μF
C1076	4030008960	Ceramic	C2012 JB 1C 104K-T-A
C1077	4510001850	Electrolytic	16 MS5 4R7 μF
C1078	4510001310	Electrolytic	6R3 MS5 22 μF
C1079	4510001470	Electrolytic	50 MS5 1 μF
C1080	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1081	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1082	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1083	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1084	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1085	4030008470	Ceramic	C1608 JB 1H 272K-T-A
C1086	4030006900	Ceramic	C1608 JB 1E 103K-T-A

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C1087	4030006770	Ceramic	C1608 SL 1H 151J-T-A
C1088	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1089	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C1090	4510001320	Electrolytic	6R3 MS5 47 μ F
C1092	4510001820	Electrolytic	10 MS5 10 μ F (D=3.0)
C1093	4030008960	Ceramic	C2012 JB 1C 104K-T-A
C1094	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C1095	4030008920	Ceramic	C1608 JB 1C 473K-T-A
C1096	4510001850	Electrolytic	16 MS5 4R7 μ F
RL1001	6330000560	Relay	OUC-SH-114D [VOL/SQL]
S1001	2260000070	Switch	SKHHAK013A [PTT]
S1002	2260000070	Switch	SKHHAK013A [LIGHT]
S1003	2260000070	Switch	SKHHAK013A [FUNC]
S1004	2260001410	Switch	SW-119 (RK09710HH) [DIAL]
BT1001	3020000040	Lithium Battery	BR2325-1HC
EP1001	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP1002	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP1003	0910028743	P.C. Board	B-2758C (MAIN)
EP1004	0910006530	F.P.C. Board	B-812

[RF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC2001	1130003650	IC	PLL2001S-ET
Q2001	1590000430	Transistor	DTC144EU T107
Q2002	1530002600	Transistor	2SC4215-O (TE85R)
Q2003	1560000270	FET	2SK302-Y (TE85R)
Q2004	1530002600	Transistor	2SC4215-O (TE85R)
Q2005	1530002060	Transistor	2SC4081 T107 R
Q2006	1510000510	Transistor	2SA1576 T107 R
Q2007	1530002060	Transistor	2SC4081 T107 R
Q2009	1510000510	Transistor	2SA1576 T107 R
Q2010	1510000510	Transistor	2SA1576 T107 R
Q2011	1590000430	Transistor	DTC144EU T107
Q2012	1590000430	Transistor	DTC144EU T107
Q2013	1590000720	Transistor	DTA144EU T107
Q2014	1590000430	Transistor	DTC144EU T107
Q2015	1520000270	Transistor	2SB1182 TL Q
Q2016	1530002060	Transistor	2SC4081 T107 R
Q2017	1590000650	Transistor	DTA144TU T107
Q2018	1530000800	Transistor	2SC1972
Q2019	1530000770	Transistor	2SC1947
Q2020	1530000641	Transistor	2SC2407AW
Q2021	1580000380	FET	3SK179 M-T1
Q2022	1580000380	FET	3SK179 M-T1
Q2023	1590000910	Transistor	IMZ2 T108
D2001	1790000620	Diode	MA77 (TW)
D2002	1790000620	Diode	MA77 (TW)
D2003	1720000330	Varicap	1SV240-T1
D2004	1720000330	Varicap	1SV240-T1
D2005	1720000330	Varicap	1SV240-T1
D2006	1720000330	Varicap	1SV240-T1
D2007	1790000590	Diode	MA110 (TW)
D2008	1790000590	Diode	MA110 (TW)
D2009	1750000160	Diode	DA114 T107
D2010	1160000050	Diode	DAP202U T107
D2011	1790000450	Diode	MA862 (TX)
D2012	1790000620	Diode	MA77 (TW)
D2013	1790000490	Diode	HSM88AS-TR
D2014	1790000490	Diode	HSM88AS-TR
D2015	1710000040	Diode	1S953
D2016	1710000040	Diode	1S953
D2017	1710000040	Diode	1S953
D2018	1750000130	Diode	DA204U T107
D2019	1750000130	Diode	DA204U T107
D2020	1730000800	Zener	RD8.2M-T2B1
D2021	1790000620	Diode	MA77 (TW)
X2001	6050001990	Crystal	CR-69
FI2001	2010000800	Filter	35M20B (FL-98)
L2001	6110002000	Coil	LA-226
L2002	6110002070	Coil	LA-227
L2003	6110002070	Coil	LA-227
L2004	6110002070	Coil	LA-227
L2005	6130001740	Coil	LB-170
L2006	6130001740	Coil	LB-170
L2007	6130001750	Coil	LB-172
L2008	6130002400	Coil	LB-266
L2009	6150003030	Coil	LS-313
L2010	6150003030	Coil	LS-313
L2011	6110001540	Coil	LA-234
L2012	6200000750	Coil	LQH 3N 4R7M
L2013	6200000750	Coil	LQH 3N 4R7M
L2014	6200000750	Coil	LQH 3N 4R7M
L2015	6110002000	Coil	LA-226
L2015	6110002000	Coil	LA-226
L2016	6140001440	Coil	LR-162
L2017	6140001010	Coil	LR-125
L2018	6140001430	Coil	LR-161
L2019	6140001010	Coil	LR-125
L2020	6140001430	Coil	LR-161
L2021	6140001010	Coil	LR-125

[RF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L2022	6140001450	Coil	LR-160
L2023	6140001010	Coil	LR-125
L2024	6180000810	Coil	LAL 03NA 2R2M
L2025	6140001720	Coil	LR-188
L2026	6180000810	Coil	LAL 03NA 2R2M
R2001	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R2002	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R2003	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2004	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2005	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R2006	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R2007	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2008	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R2009	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R2010	7030003290	Resistor	ERJ3GEYJ 560 V (56 Ω)
R2011	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R2012	7030003260	Resistor	ERJ3GEYJ 330 V (33 Ω)
R2013	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R2014	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2015	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R2016	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R2017	7030003700	Resistor	ERJ3GEYJ 154 V (150 kΩ)
R2018	7030003740	Resistor	ERJ3GEYJ 334 V (330 kΩ)
R2019	7030003690	Resistor	ERJ3GEYJ 124 V (120 kΩ)
R2020	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2021	7310002600	Trimmer	RV-110 (RH03 A3AS4X0AA) 473
R2022	7030003570	Resistor	ERJ3GEYJ 123 V (12 kΩ)
R2023	7030003880	Resistor	ERJ3GEYJ 244 V (240 kΩ)
R2024	7030003250	Resistor	ERJ3GEYJ 270 V (27 Ω)
R2025	7030003530	Resistor	ERJ3GEYJ 562 V (5.6 kΩ)
R2026	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2028	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2029	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R2030	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R2032	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R2033	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R2034	7030003350	Resistor	ERJ3GEYJ 181 V (180 Ω)
R2035	7030003260	Resistor	ERJ3GEYJ 330 V (33 Ω)
R2036	7030003350	Resistor	ERJ3GEYJ 181 V (180 Ω)
R2037	7010004320	Resistor	R20J 10 kΩ
R2038	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R2039	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R2040	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R2041	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2042	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R2043	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R2044	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2045	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R2046	7010004060	Resistor	R20J 82 Ω
R2047	4610001400	Trimmer	EVMLGGA00B32 (301)
R2048	4610001400	Trimmer	EVMLGGA00B32 (301)
R2049	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2050	7010004090	Resistor	R20J 150 Ω
R2051	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R2052	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2053	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2054	7030003350	Resistor	ERJ3GEYJ 181 V (180 Ω)
R2055	7030003350	Resistor	ERJ3GEYJ 181 V (180 Ω)
R2056	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R2057	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
R2058	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R2059	4610001230	Trimmer	EVMLGGA00B14 (103)
R2060	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2061	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R2062	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R2063	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2064	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2065	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2066	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2067	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R2068	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R2069	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R2070	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R2071	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2072	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)

[RF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R2073	7030003710	Resistor	ERJ3GEYJ 184 V (180 kΩ)
R2074	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R2075	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2076	7030003290	Resistor	ERJ3GEYJ 560 V (56 Ω)
C2001	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2002	4030006600	Ceramic	C1608 SL 1H 090D-T-A
C2003	4030006700	Ceramic	C1608 SL 1H 390J-T-A
C2004	4030006540	Ceramic	C1608 SL 1H 030C-T-A
C2005	4030006670	Ceramic	C1608 SL 1H 270J-T-A
C2006	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2007	4030006640	Ceramic	C1608 SL 1H 180J-T-A
C2008	4030006690	Ceramic	C1608 SL 1H 330J-T-A
C2009	4030006630	Ceramic	C1608 SL 1H 150J-T-A
C2010	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2011	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2012	4030006540	Ceramic	C1608 SL 1H 030C-T-A
C2013	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2014	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2015	4030006520	Ceramic	C1608 SL 1H 010C-T-A
C2016	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2017	4030006830	Ceramic	C1608 SL 1H 331J-T-A
C2018	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2019	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2020	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2021	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2022	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2023	4030006530	Ceramic	C1608 SL 1H 020C-T-A
C2024	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2025	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2026	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2027	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C2028	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2029	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2030	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2031	4030006590	Ceramic	C1608 SL 1H 080D-T-A
C2032	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C2033	4030006610	Ceramic	C1608 SL 1H 100D-T-A
C2034	4030006890	Ceramic	C1608 JF 1H 103Z-T-A
C2035	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2036	4550002890	Tantalum	TESVA 1A 225M1-8L
C2037	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2038	4510001850	Electrolytic	16 MS5 4R7 μF
C2039	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2040	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2041	4510001850	Electrolytic	16 MS5 4R7 μF
C2043	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2044	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2047	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2048	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2049	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2050	4510001470	Electrolytic	50 MS5 1 μF
C2051	4510001320	Electrolytic	6R3 MS5 47 μF
C2052	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2053	4030009230	Ceramic	C1608 SL 1H 240J-T-A
C2054	4610000300	Trimmer	ECRGA015E30
C2055	4030006670	Ceramic	C1608 SL 1H 270J-T-A
C2056	4550000460	Tantalum	TESVA 1C 105M1-8L
C2057	4550000530	Tantalum	TESVA 1V 104M1-8L
C2058	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2059	4030006550	Ceramic	C1608 SL 1H 040C-T-A
C2060	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2061	4510003190	Electrolytic	6.3RC2 47 μF (D=4.0)
C2062	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2063	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2064	4510003190	Electrolytic	6.3 RC2 47 μF (D=4.0)
C2065	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2066	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2068	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2069	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2070	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2072	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2073	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2074	4510001350	Electrolytic	16 MS5 10 μF
C2075	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2076	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2077	4510001350	Electrolytic	16 MS5 10 μF

[RF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C2078	4030006750	Ceramic	C1608 SL 1H 101J-T-A
C2079	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2080	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2081	4030006890	Ceramic	C1608 JF 1H 103Z-T-A
C2082	4510001820	Electrolytic	10 MS5 10 μ F (D=3.0)
C2083	4030006610	Ceramic	C1608 SL 1H 100D-T-A
C2084	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2085	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2086	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2087	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2088	4510001350	Electrolytic	16 MS5 10 μ F
C2089	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2090	4030006890	Ceramic	C1608 JF 1H 103Z-T-A
C2091	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2092	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2093	4510001350	Electrolytic	16 MS5 10 μ F
C2094	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2095	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2096	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2097	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2098	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C2100	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2101	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2102	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2103	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2104	4510001850	Electrolytic	16 MS5 4R7 μ F
C2105	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2106	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2107	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2108	4510001820	Electrolytic	10 MS5 10 μ F (D=3.0)
C2109	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2110	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2111	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C2112	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2113	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C2114	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2115	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2116	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2117	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2118	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2119	4510001850	Electrolytic	16 MS5 4R7 μ F
C2120	4030008920	Ceramic	C1608 JB 1C 473K-T-A
C2121	4030006770	Ceramic	C1608 SL 1H 151J-T-A
C2122	4550001870	Tantalum	DN 0J 4R7M
C2123	4030006580	Ceramic	C1608 SL 1H 070D-T-A
EP2001	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP2002	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP2003	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP2004	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP2005	6910000970	Lead Frame	DL 2OP 2.6-3-1.2H
EP2006	0910028483	P.C. Board	B-2759C (RF)

[VCO UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q2201	1530000371	Transistor	2SC3356 R25-T2B
Q2202	1530000371	Transistor	2SC3356 R25-T2B
Q2203	1590000660	Transistor	DTC144TU T107
Q2204	1530002560	Transistor	2SC4403-3-TR
Q2205	1530002560	Transistor	2SC4403-3-TR
Q2206	1530002560	Transistor	2SC4403-3-TR
Q2207	1530002560	Transistor	2SC4403-3-TR
D2201	1790000620	Diode	MA77 (TW)
D2202	1720000330	Varicap	1SV240-T1
L2201	6130002360	Coil	LB-257
L2202	6200001140	Coil	MLF2012D R18M-T
L2203	6200001140	Coil	MLF2012D R18M-T
L2204	6200001140	Coil	MLF2012D R18M-T
L2205	6200001160	Coil	MLF2012D R27M-T
R2201	7030003340	Resistor	ERJ3GEYJ 151 V (150 Ω)
R2202	7030003460	Resistor	ERJ3GEYJ 152 V (1.5 kΩ)
R2203	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R2204	7030003550	Resistor	ERJ3GEYJ 822 V (8.2 kΩ)
R2205	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R2206	7030003550	Resistor	ERJ3GEYJ 822 V (8.2 kΩ)
R2207	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R2208	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R2209	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2210	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2211	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R2212	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R2213	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2214	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R2215	7030003290	Resistor	ERJ3GEYJ 560 V (56 Ω)
R2216	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
C2202	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C2203	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2204	4010000500	Ceramic	DD104 B 102K 50V
C2205	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2206	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2207	4030006540	Ceramic	C1608 SL 1H 030C-T-A
C2208	4030006540	Ceramic	C1608 SL 1H 030C-T-A
C2209	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2210	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2211	4030006510	Ceramic	C1608 SL 1H 0R5C-T-A
C2212	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2213	4030006670	Ceramic	C1608 SL 1H 270J-T-A
C2214	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2215	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2216	4010000200	Ceramic	DD104 SL 270J 50V
C2217	4030006510	Ceramic	C1608 SL 1H 0R5C-T-A
C2218	4030006670	Ceramic	C1608 SL 1H 270J-T-A
C2219	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2220	4010000120	Ceramic	DD104 SL 100D 50V
C2221	4010000500	Ceramic	DD104 B 102K 50V
C2222	4030006860	Ceramic	C1608 JB 1H 102K-T-A
EP2201	0910028272	P.C. Board	B-2764B (VCO)

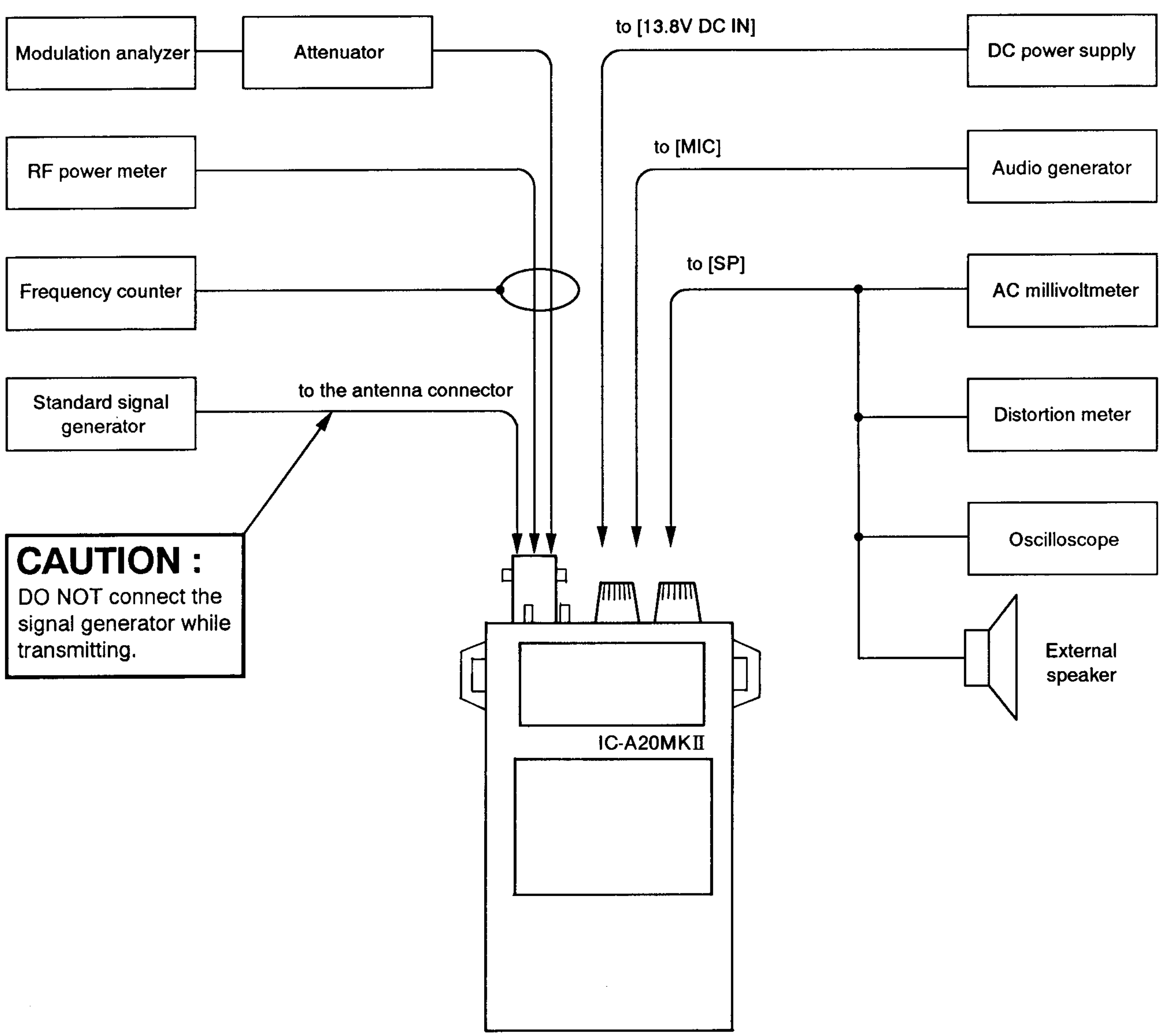
6-1 PREPARATION BEFORE SERVICING

■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 13.2 V DC Current capacity : 2 A or more	Oscilloscope	Frequency range : DC~20 MHz
		DC voltmeter	Input impedance : 50 kΩ/DC or better
RF power meter	Measuring range : 1~10 W Frequency range : 100~180 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	AC millivoltmeter	Measuring range : 10 mV~10 V
		External speaker	Impedance : 8 Ω
Frequency counter	Frequency range : 0.1~180 MHz Frequency accuracy: ± 1 ppm or better Sensitivity : 100 mV or better	Ammeter	Measuring range : 200 mA
		Audio generator (AG)	Frequency range : 200~2000Hz Output level : 1~200 mV
Standard signal generator (SSG)	Frequency range : 0.1~180 MHz Output level : 0.1 µV~32 mV (−127~−17 dBm)	Attenuator	Power attenuation : 40 or 50 dB Capacity : 10 W or more
Distortion meter	Frequency range :1 kHz ± 10 Hz Measuring range :1~20 %	Modulation analyzer	Frequency minimum: 180 MHz Measuring range : 0~100%

CW : clockwise CCW : counterclockwise CP : check point

■ CONNECTION



6-2 PLL ADJUSTMENT

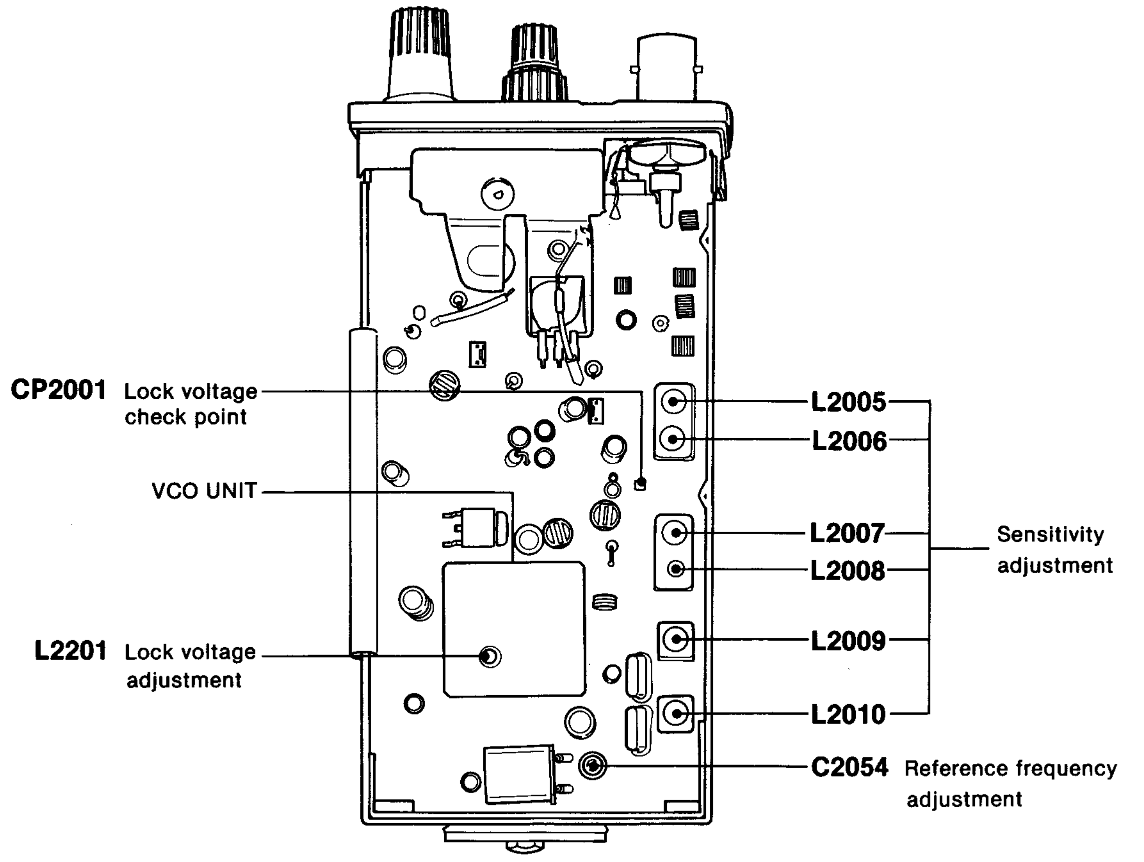
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Displayed frequency: 108.000 MHz • Receiving	RF	Connect the DC voltmeter to CP2001.	1.3 V	VCO	L2201
REFERENCE FREQUENCY	1	• Displayed frequency: 135.975 MHz • Connect the RF power meter or a 50 Ω dummy load to the antenna connector. • Transmitting	Top panel	Loosely couple the frequency counter to the antenna connector.	135.975 MHz	RF	C2054

6-3 RECEIVER ADJUSTMENT

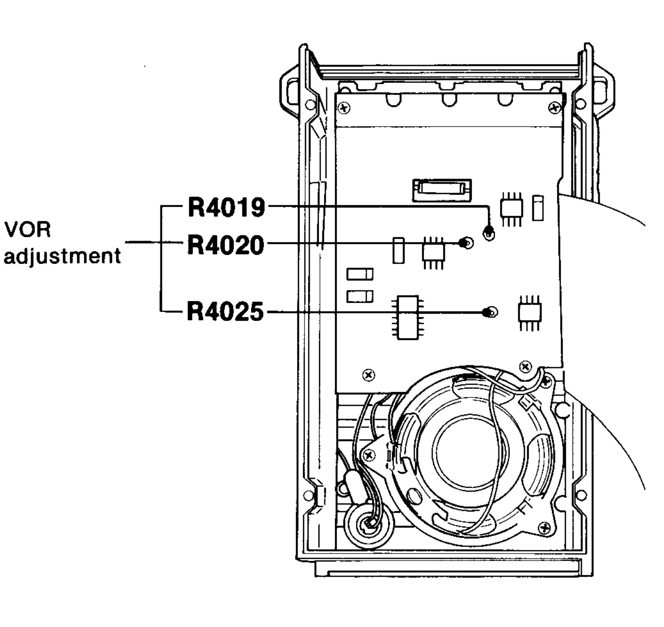
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1	• Displayed frequency: 118.000 MHz • Connect the SSG to the antenna connector and set as: Level : 1.0 μV* (− 107 dBm) Modulation : 1 kHz, 30% • Receiving	Top panel	Connect the AC millivoltmeter and oscilloscope with an external speaker to the [SP] jack.	Max. audio output	RF	L2005~L2008
	2						L2009 L2010
	3	• Set the SSG as: Level : 1.0 mV* (− 47 dBm)				MAIN	L1001
VOR	1	Turn the IC-A21 power OFF. Then, while pushing [1] and [9] on the keyboard, turn the power ON.					
	2	• Displayed frequency: 113.000 MHz • Connect the SSG to the antenna connector and set as: Level : 0.22 mV * (− 60 dBm) Bearing : From, 90° Modulation : 9.960 Hz, 30% 30 Hz, 30% • R4019 : Center • Receiving	Front panel	Function display	"FROM, 90°"	VOR	R4020 for rough adjustment R4019 for fine adjustment
	3	• Connect the SSG to the antenna connector and set as: Level : 7.1 μV* (− 90 dBm) Modulation : 9.960 Hz, 15% 30 Hz, 30%			Adjust volume to a point just after the course indicator appears.		R4025

* This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.

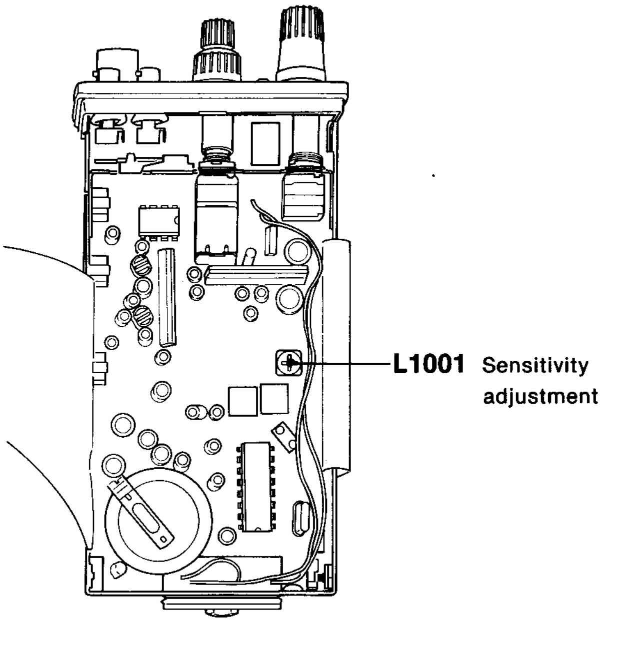
• **RF UNIT**



• **VOR UNIT**



• **MAIN UNIT**

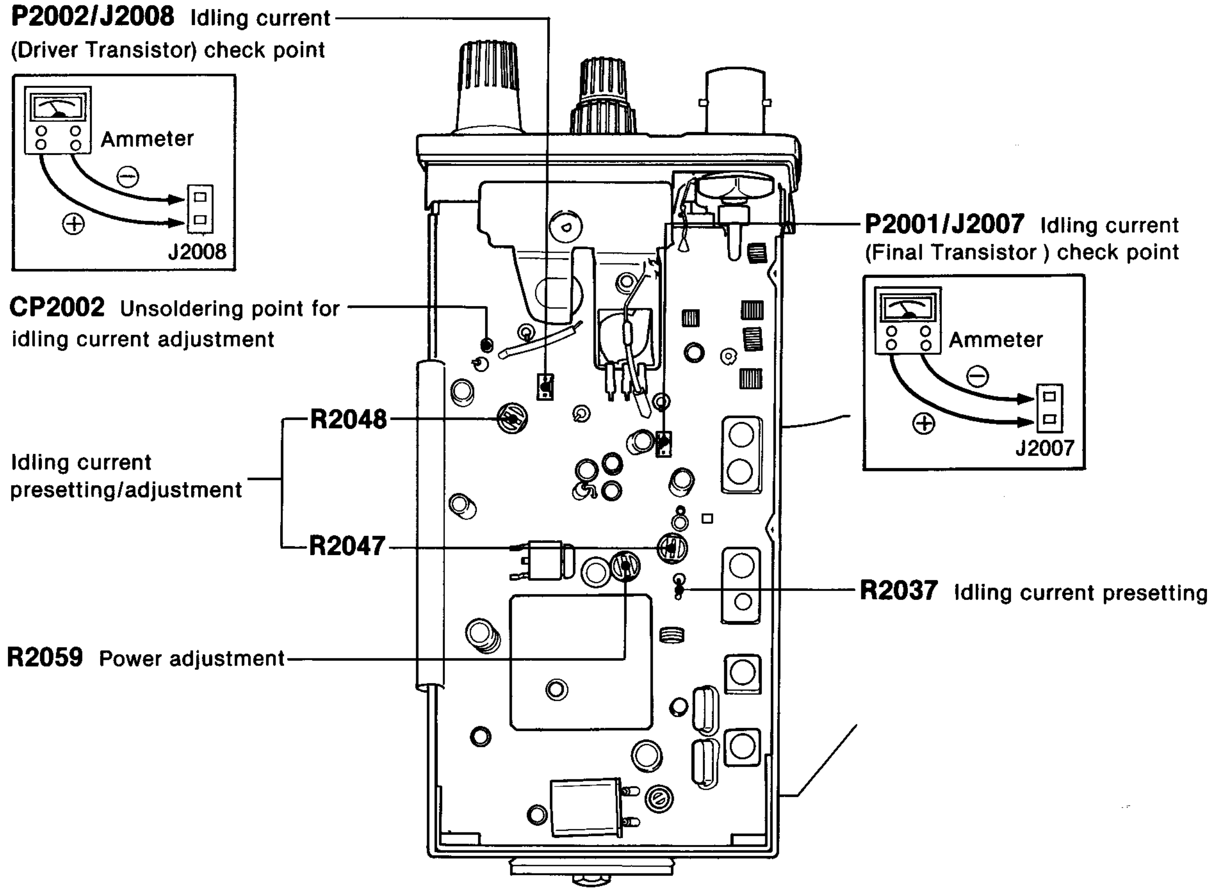


6-4 TRANSMITTER ADJUSTMENT

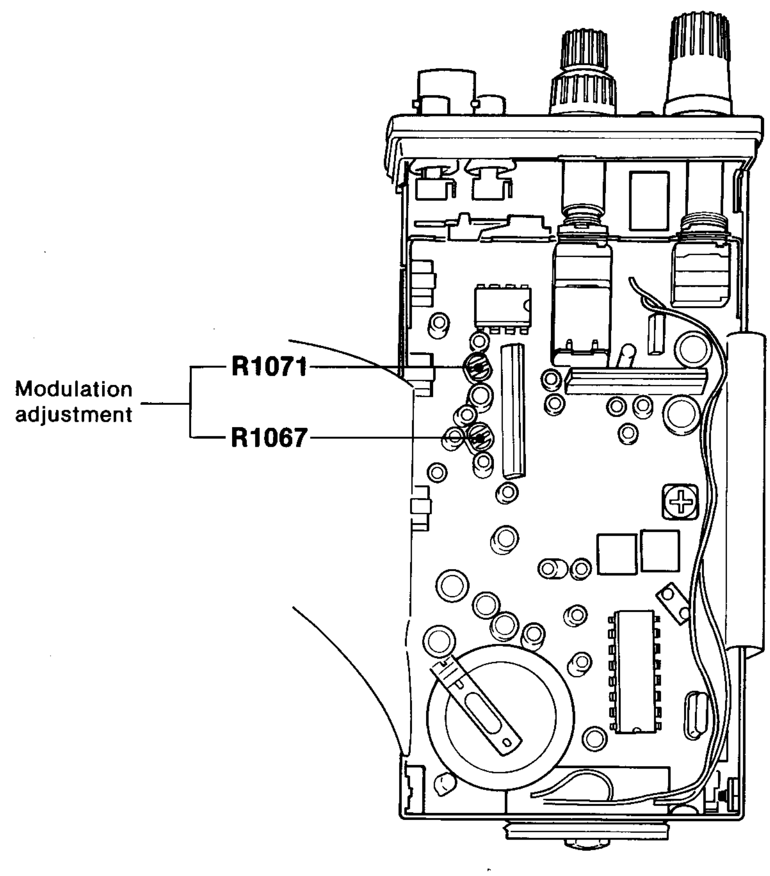
<table>
<tr><th rowspan="2" colspan="2">ADJUSTMENT</th><th rowspan="2">ADJUSTMENT CONDITIONS</th><th colspan="2">MEASUREMENT</th><th rowspan="2">VALUE</th><th colspan="2">ADJUSTMENT POINT</th></tr>
<tr><th>UNIT</th><th>LOCATION</th><th>UNIT</th><th>ADJUST</th></tr>
<tr><td rowspan="3">IDLING CURRENT

① For driver transistor
- - - - - - -
② For final transistor</td><td>1</td><td rowspan="2">• Displayed frequency: 127.500 MHz
• Unsolder CP2002.
• Connect the RF power meter to the antenna connector.
• Unplug P2002 and P2001 on J2008 and J2007.
• R2047, R2048 : Max. CCW
• Ground the lead of R2037 with a wire.
• Transmitting</td><td rowspan="2">RF</td><td>Connect the ammeter to J2008.</td><td>30 mA</td><td rowspan="2">RF</td><td>R2048</td></tr>
<tr><td>2</td><td>Connect the ammeter to J2007.</td><td>100 mA</td><td>R2047</td></tr>
<tr><td colspan="7">NOTE: After adjustment, turn the power OFF. Then, re-plug P2002 and P2001 into J2008 and J2007, respectively. Remove the wire from R2037. After adjustment, re-solder CP2002.</td></tr>
<tr><td rowspan="4">POWER</td><td>1</td><td>• Displayed frequency: 127.500 MHz
• [HIGH/LOW] switch : HIGH
• Do not apply any signals to the microphone.
• Transmitting</td><td rowspan="3">Top panel</td><td rowspan="3">Connect the RF power meter to the antenna connector.</td><td>1.5 W</td><td rowspan="3">RF</td><td>R2059</td></tr>
<tr><td>2</td><td>• Displayed frequency: 118.000 MHz</td><td rowspan="2">1.1~1.7 W</td><td rowspan="2">Verify</td></tr>
<tr><td>3</td><td>• Displayed frequency: 136.975 MHz</td></tr>
<tr><td colspan="7">NOTE: This adjustment must be performed with the MP2014 shield plate. If the output power is less than 1.1 W in steps 2 and 3, adjust R2059 again so that output power is more than 1.1 W on both 118.000 MHz and 136.975 MHz.</td></tr>
<tr><td rowspan="4">MODU-
LATION</td><td>1</td><td>• Displayed frequency: 127.500 MHz
• R1067, R1071 : Center
• [HIGH/LOW] switch : HIGH
• Connect the AG to the [MIC] jack and set as:
Level : 150 mV
Modulation : 1 kHz
• Set the modulation analyzer as:
HPF : 20 Hz
LPF : 20 kHz
• Transmitting</td><td rowspan="3">Top panel</td><td rowspan="3">Connect the modulation analyzer to the antenna connector via an attenuator.</td><td>90 %</td><td rowspan="3">MAIN</td><td>R1071</td></tr>
<tr><td>2</td><td>• Set the AG as:
Level : 15 mV</td><td>33 %</td><td>R1067</td></tr>
<tr><td>3</td><td>• Set the AG as:
Level : 150 mV</td><td>80~100 %</td><td>Verify</td></tr>
<tr><td colspan="7">NOTE: If the modulation level is less than 80% or more than 100%, adjust R1071 again.</td></tr>
</table>

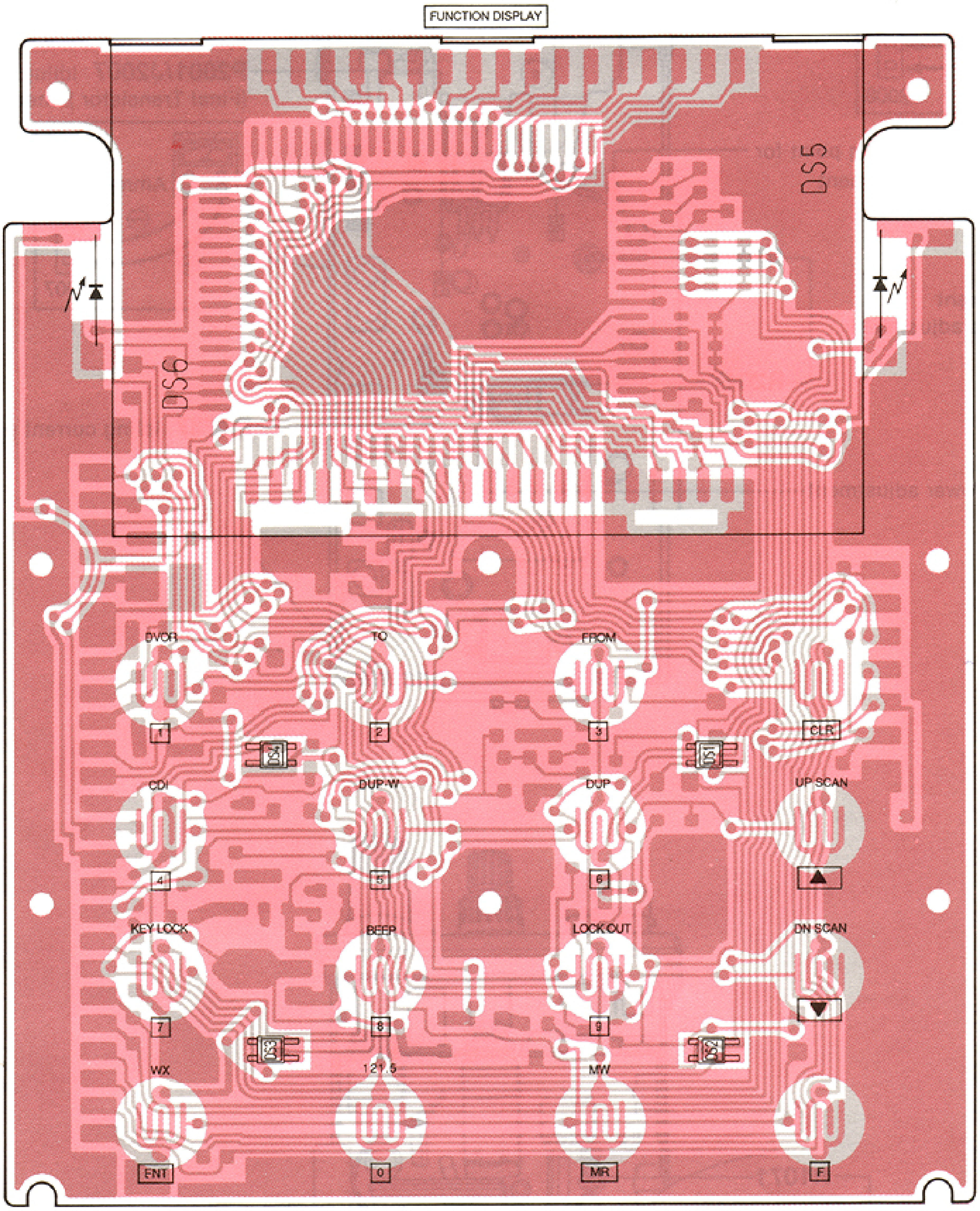
• RF UNIT



• MAIN UNIT

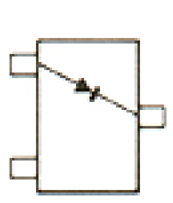


7-1 LOGIC UNIT



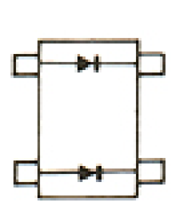
NOTE: Add "3000" to each indicated part number on the unit for the actual part number.

DA114
(Symbol: AV)

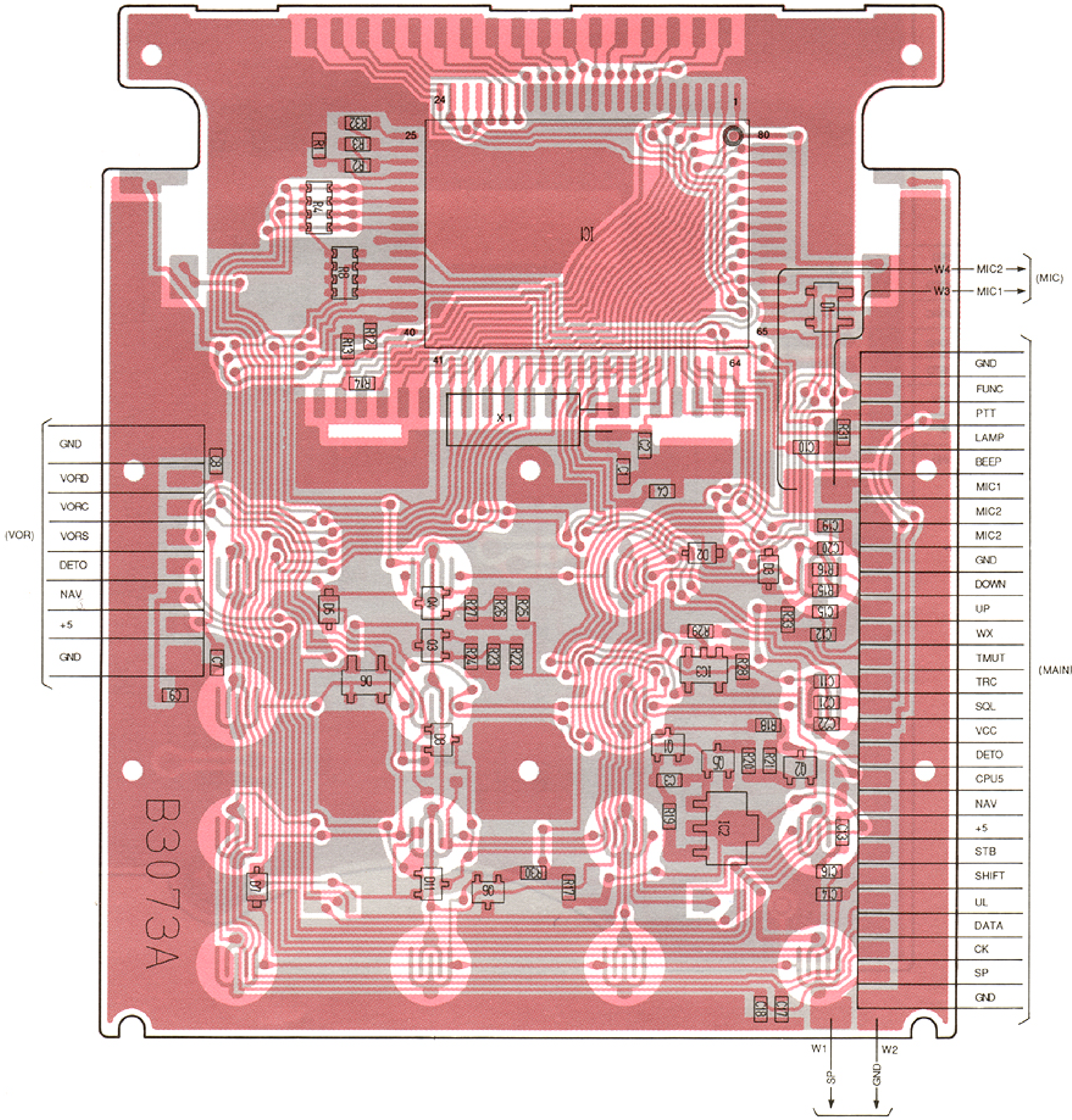


D3008, D3011

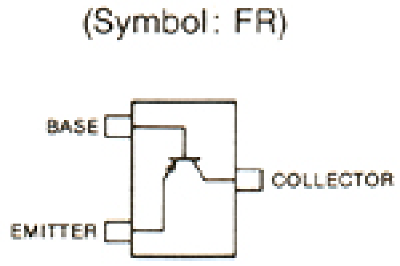
DWA010
(Symbol: W8)



D3001, D3006

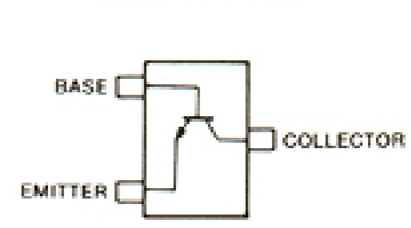


2SA1576 R
(Symbol: FR)



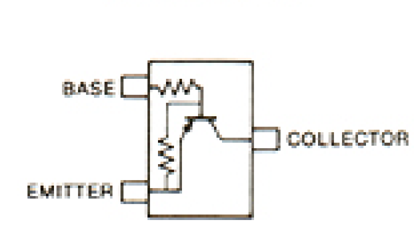
Q3002

2SC4081 R
(Symbol: BR)



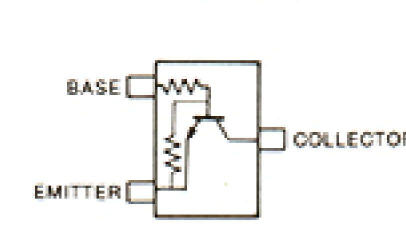
Q3001, Q3003, Q3004

DTA144TU
(Symbol: 16)



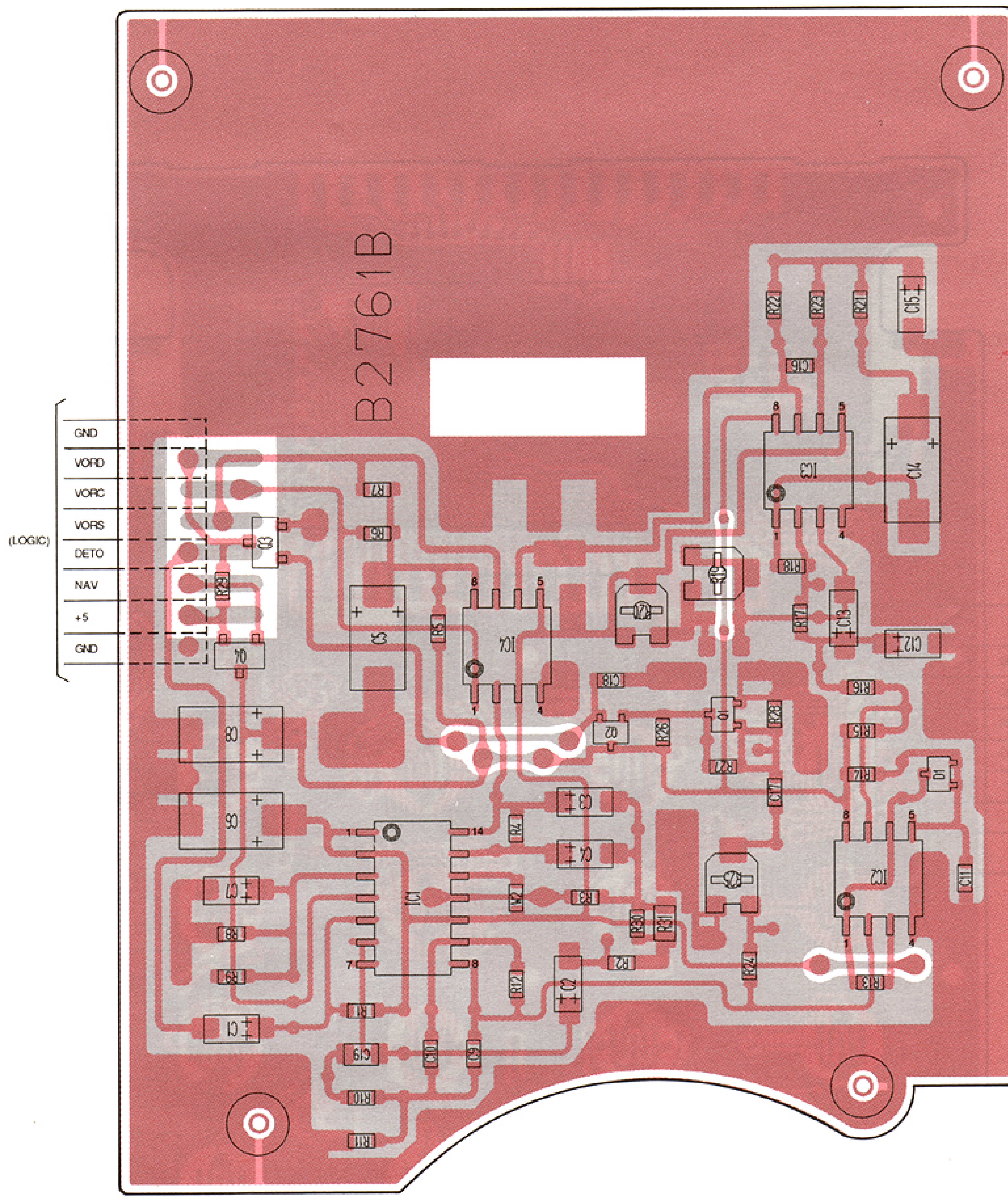
Q3006

DTC144EU
(Symbol: 26)



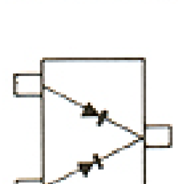
Q3005

7-2 VOR UNIT



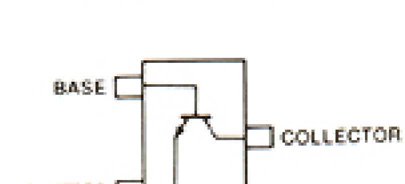
NOTE: Add "4000" to each indicated part number on the unit for the actual part number.

DAN202U
(Symbol: N)



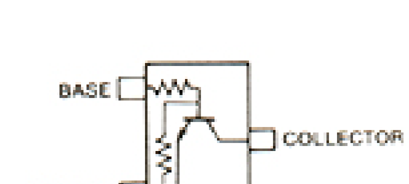
D4001

2SC4081 R
(Symbol: BR)



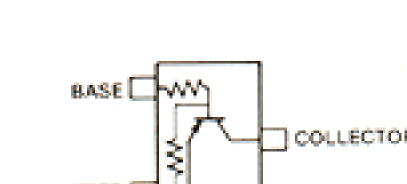
Q4001, Q4002

RN1409
(Symbol: XJ)



Q4003

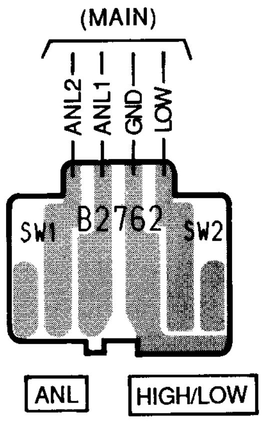
RN2403
(Symbol: YC)



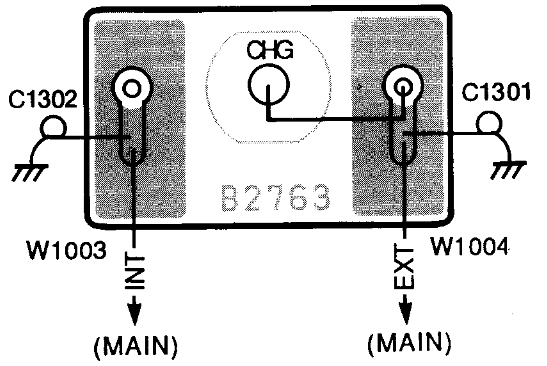
Q4004

7-3 MAIN UNIT

• SW UNIT



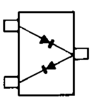
• PRT UNIT



NOTE: Add "1200" to each indicated part number on the unit for the actual part number.

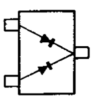
• MAIN UNIT

1SS226
(Symbol: C3)



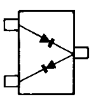
D1006

DAN202U
(Symbol: N)



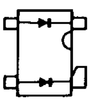
D1014

HSM88AS
(Symbol: C1)



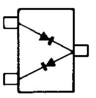
D1013

MA862
(Symbol: M1I)



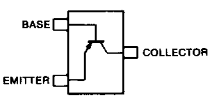
D1001, D1002

ND411G-1-T2
(Symbol: 411)



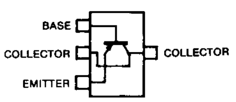
D1003

2SA1576 R
(Symbol: FR)



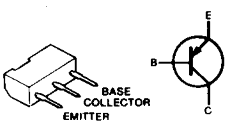
Q1014, Q1022

2SB798 DK
(Symbol: DK)



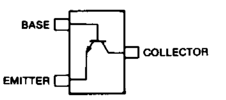
Q1016, Q1018

2SB909M R



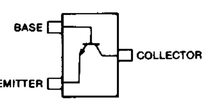
Q1024

2SC4081 R
(Symbol: BR)



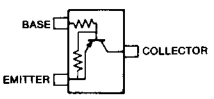
Q1003, Q1008, Q1010
Q1011, Q1012, Q1013
Q1015, Q1017, Q1023

2SC4215-O
(Symbol: QO)



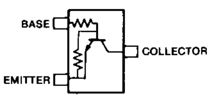
Q1001, Q1002

DTA144TU
(Symbol: 16)



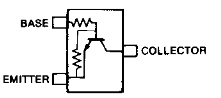
Q1019, Q1021

DTC144EU
(Symbol: 26)



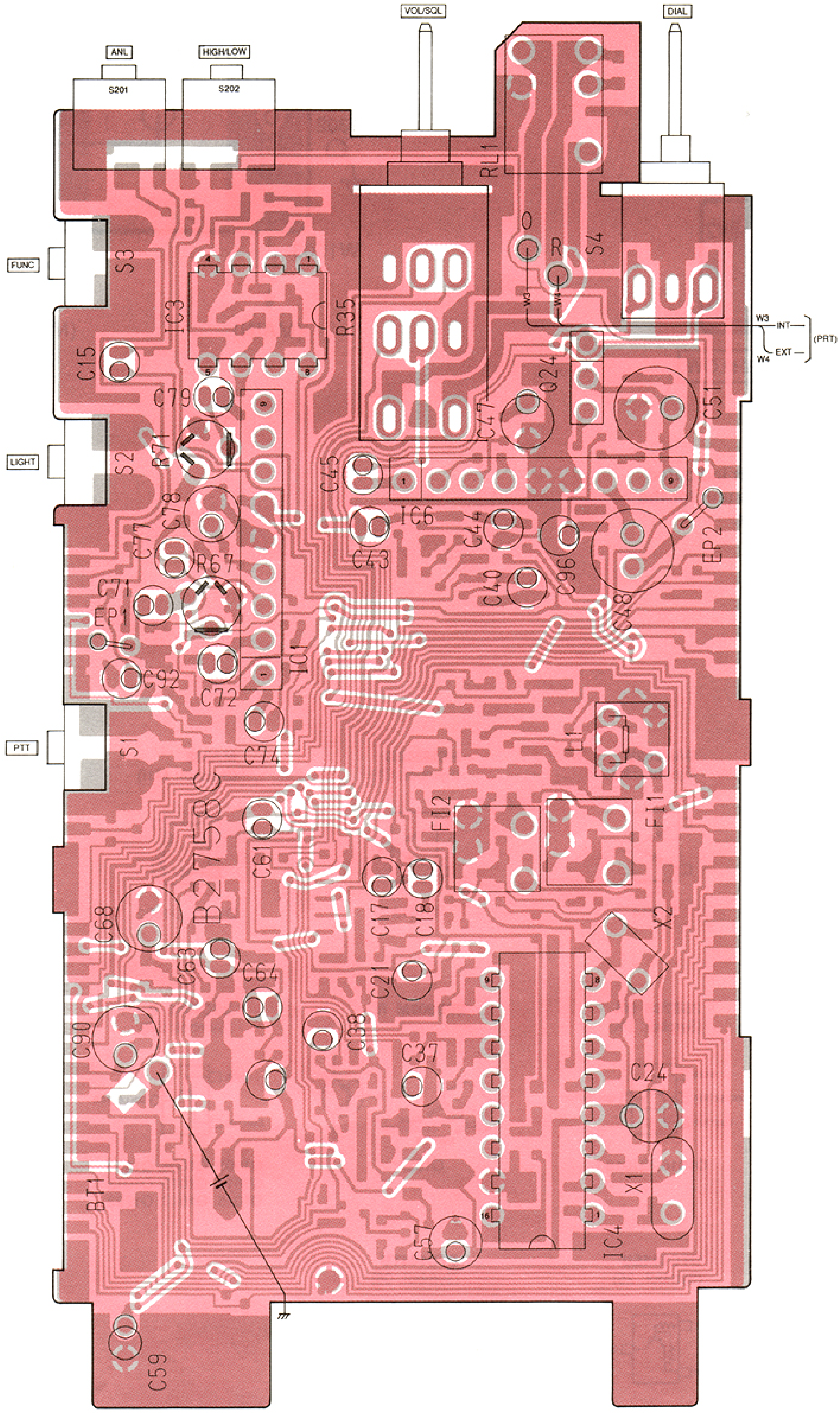
Q1006, Q1009

DTC144TU
(Symbol: 06)

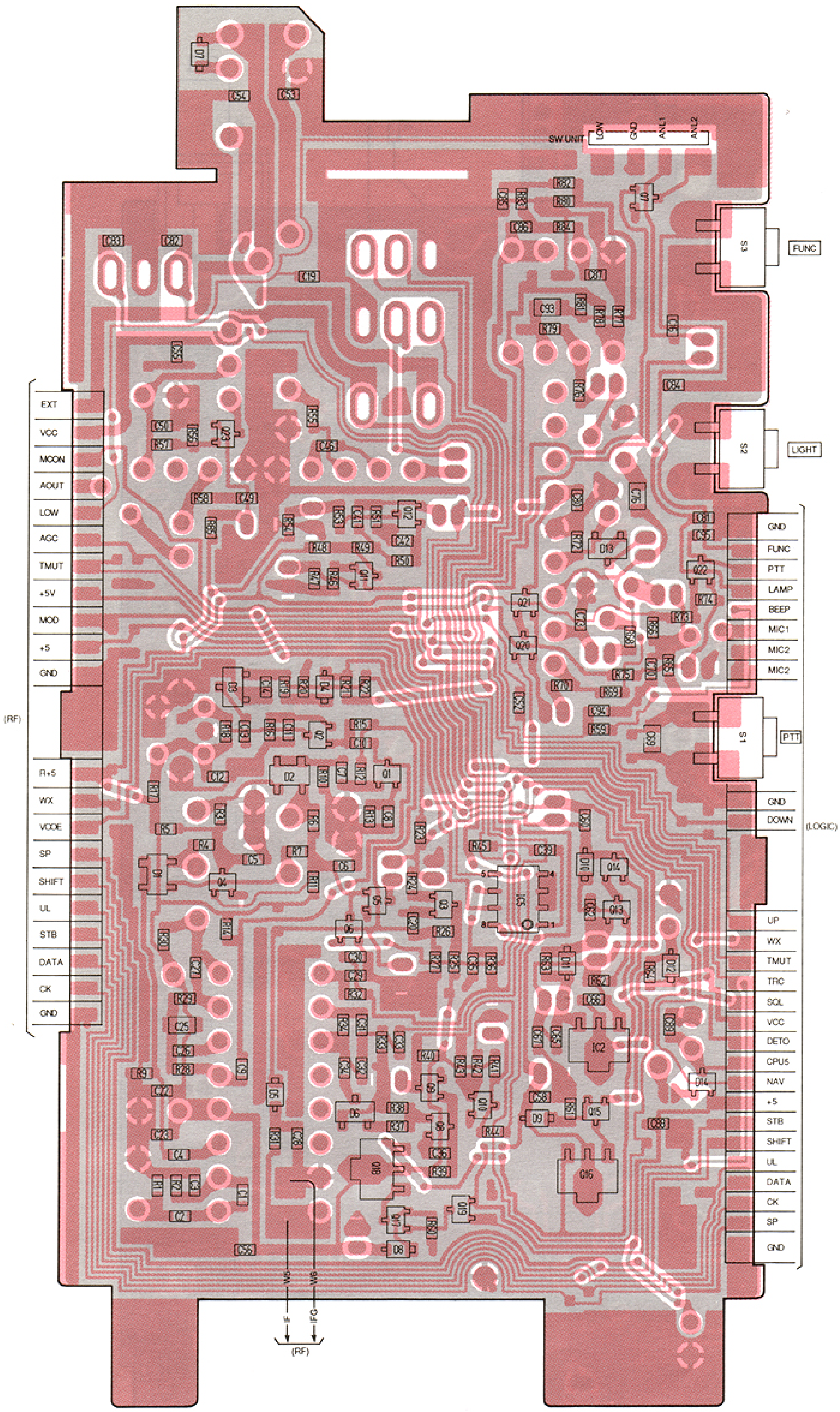


Q1004, Q1005, Q1007
Q1020

• MAIN UNIT

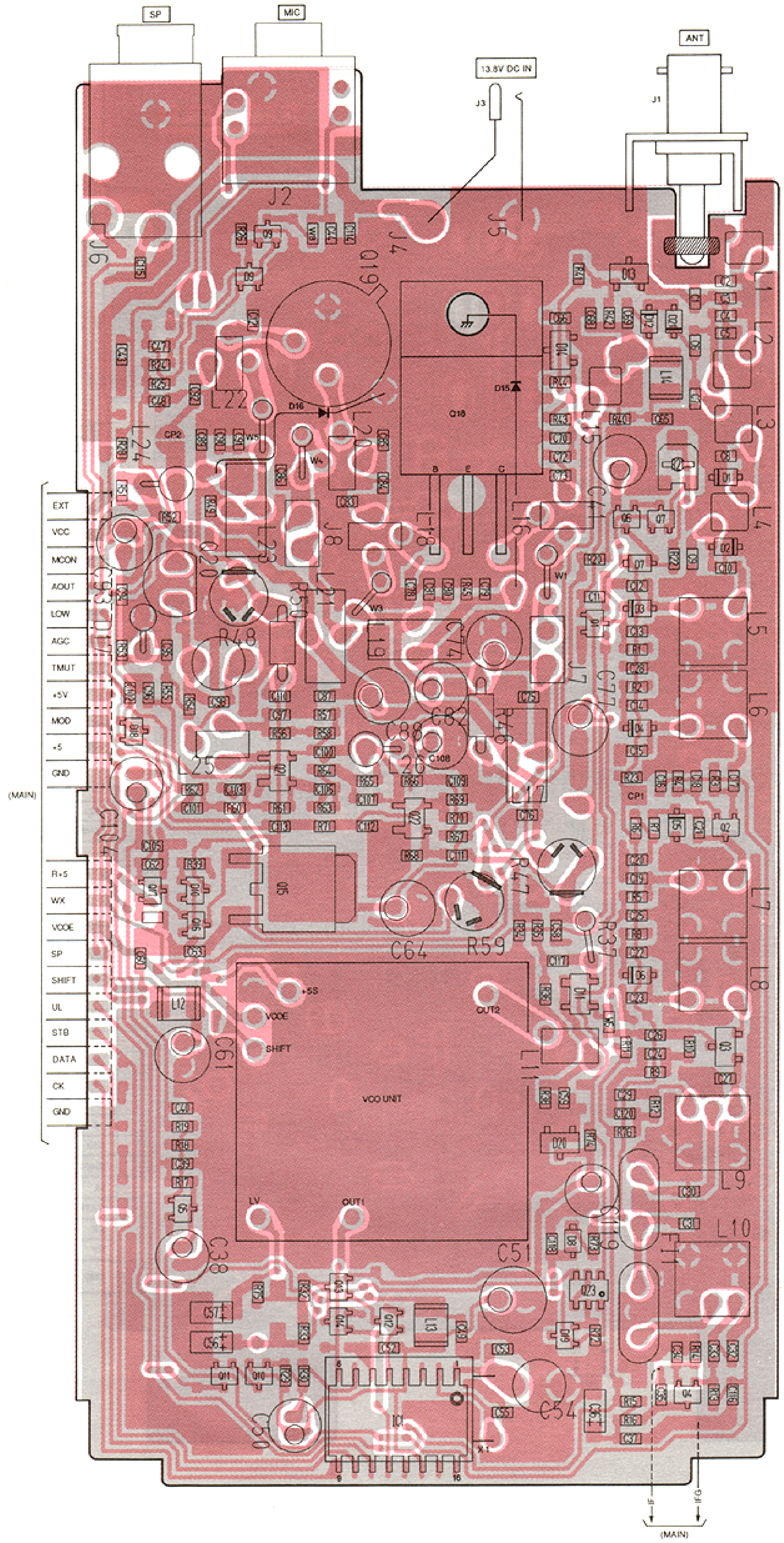


NOTE: Add "1000" to each indicated part number on the unit for the actual part number.


SW UNIT
LOW
GND
ANL1
ANL2
S3
FUNC
S2
LIGHT
S1
PTT
EXT
VCC
MCON
AOUT
LOW
AGC
TMUT
+5V
MOD
+5
GND
(RF)
R+5
WX
VCDE
SP
SHIFT
UL
STB
DATA
CK
GND
GND
FUNC
PTT
LAMP
BEEP
MIC1
MIC2
MIC2
GND
DOWN
(LOGIC)
UP
WX
TMUT
TRC
SQL
VCC
DETO
CPU5
NAV
+5
STB
SHIFT
UL
DATA
CK
SP
GND
IF
IFG
(RF)

7-4 RF AND VCO UNITS

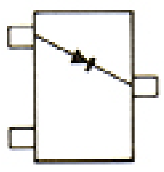
• RF UNIT



NOTE: Add "2000" to each indicated part number on the unit for the actual part number.

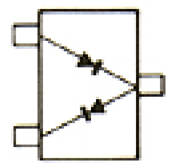
• RF UNIT

DA114
(Symbol: AV)



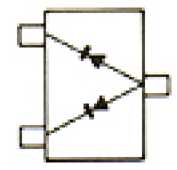
D2009

DA204U
(Symbol: K)



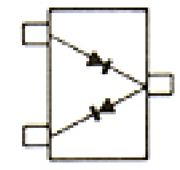
D2018, D2019

DAP202U
(Symbol: P)



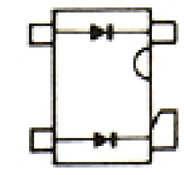
D2010

HSM88AS
(Symbol: C1)



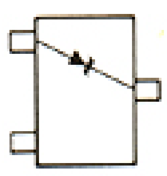
D2013, D2014

MA862
(Symbol: M1I)



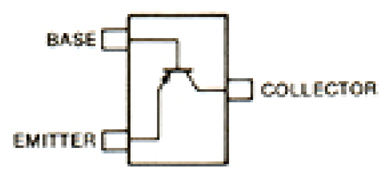
D2011

RD8.2M B1
(Symbol: 821)



D2020

2SA1576 R
(Symbol: FR)



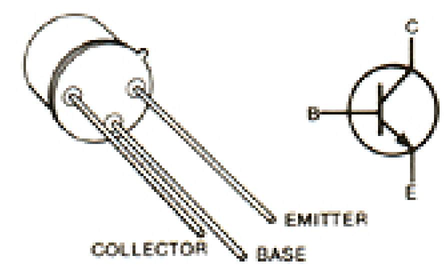
Q2006, Q2009, Q2010

2SB1182 TL Q



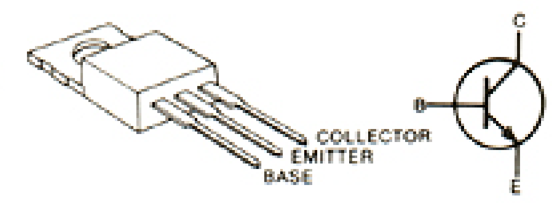
Q2015

2SC1947



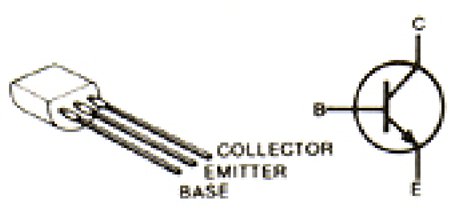
Q2019

2SC1972



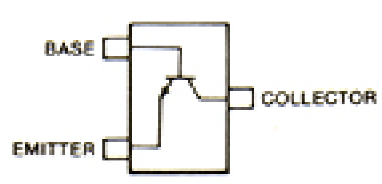
Q2018

2SC2407AW



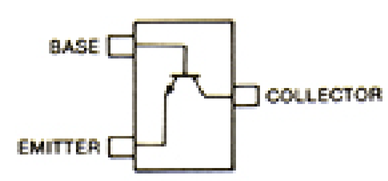
Q2020

2SC4081 R
(Symbol: BR)



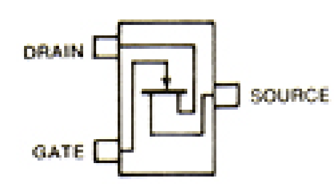
Q2005, Q2007, Q2016

2SC4215-O
(Symbol: QO)



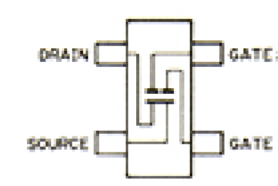
Q2002, Q2004

2SK302 Y
(Symbol: TY)



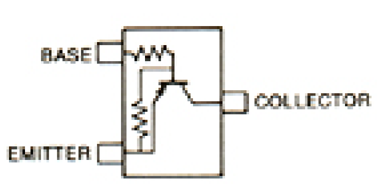
Q2003

3SK179 M
(Symbol: VO1)



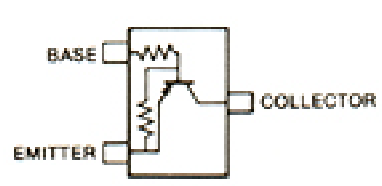
Q2021, Q2022

DTA144EU
(Symbol: 16)



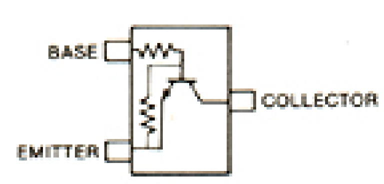
Q2013

DTA144TU
(Symbol: 16)



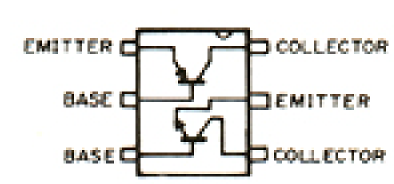
Q2017

DTC144EU
(Symbol: 26)



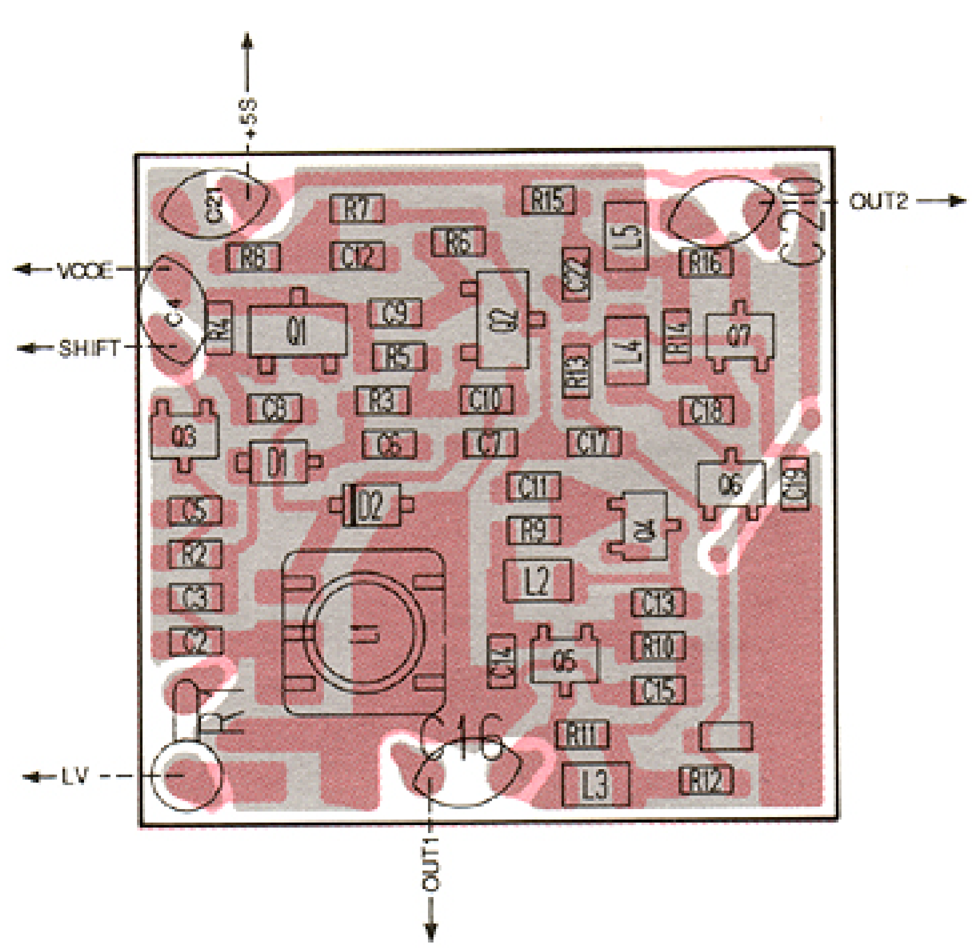
Q2001, Q2011, Q2012
Q2014

IMZ2
(Symbol: Z2)

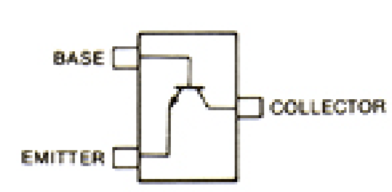


Q2023

• VCO UNIT

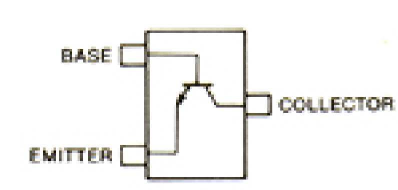


2SC3356 R25
(Symbol: R25)



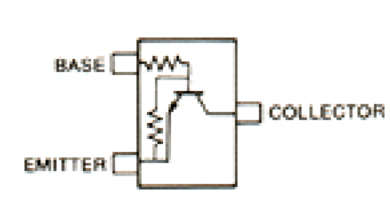
Q2201, Q2202

2SC4403 3
(Symbol: LY3)



Q2204, Q2205, Q2206
Q2207

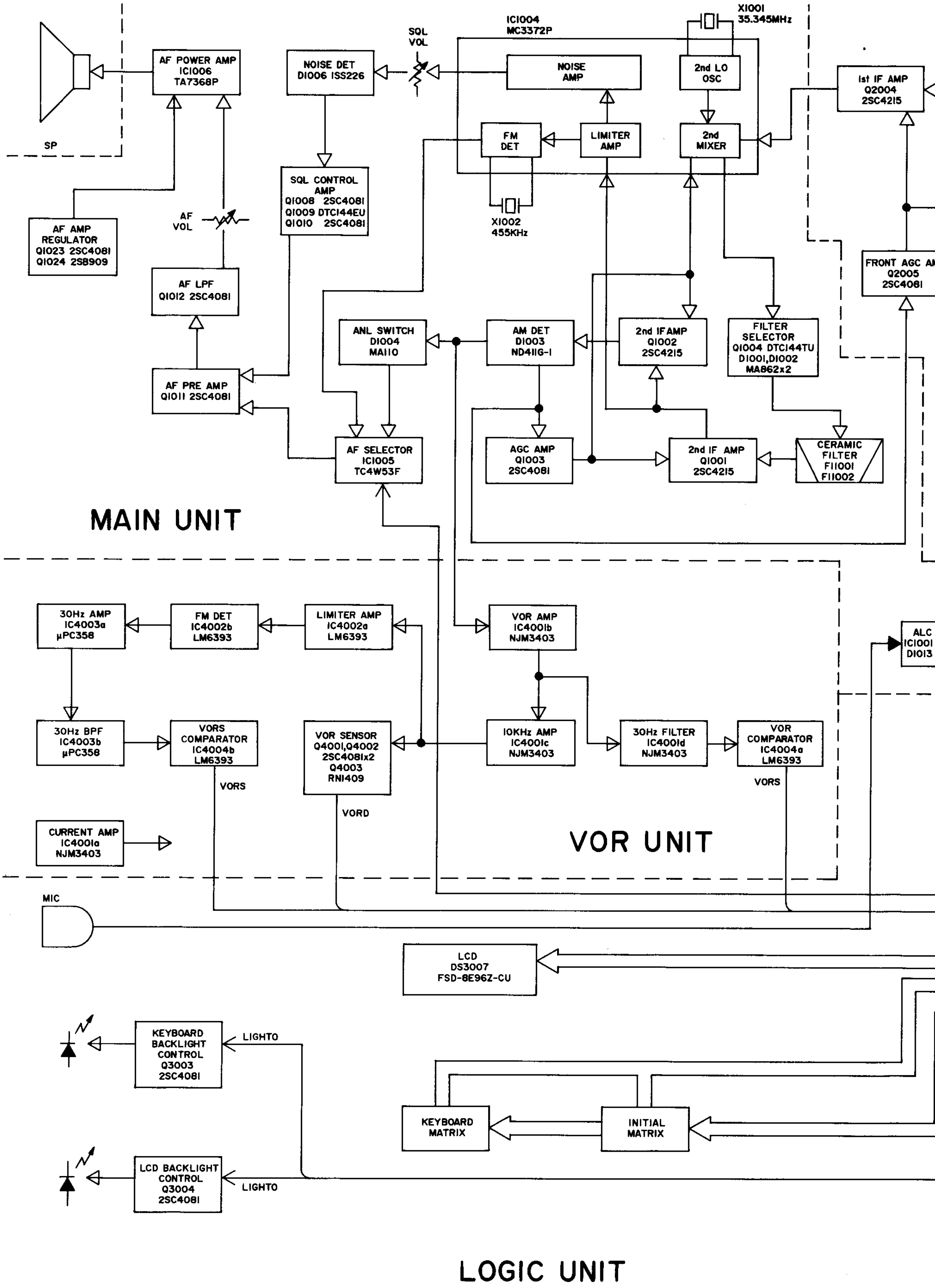
DTC144TU
(Symbol: 06)

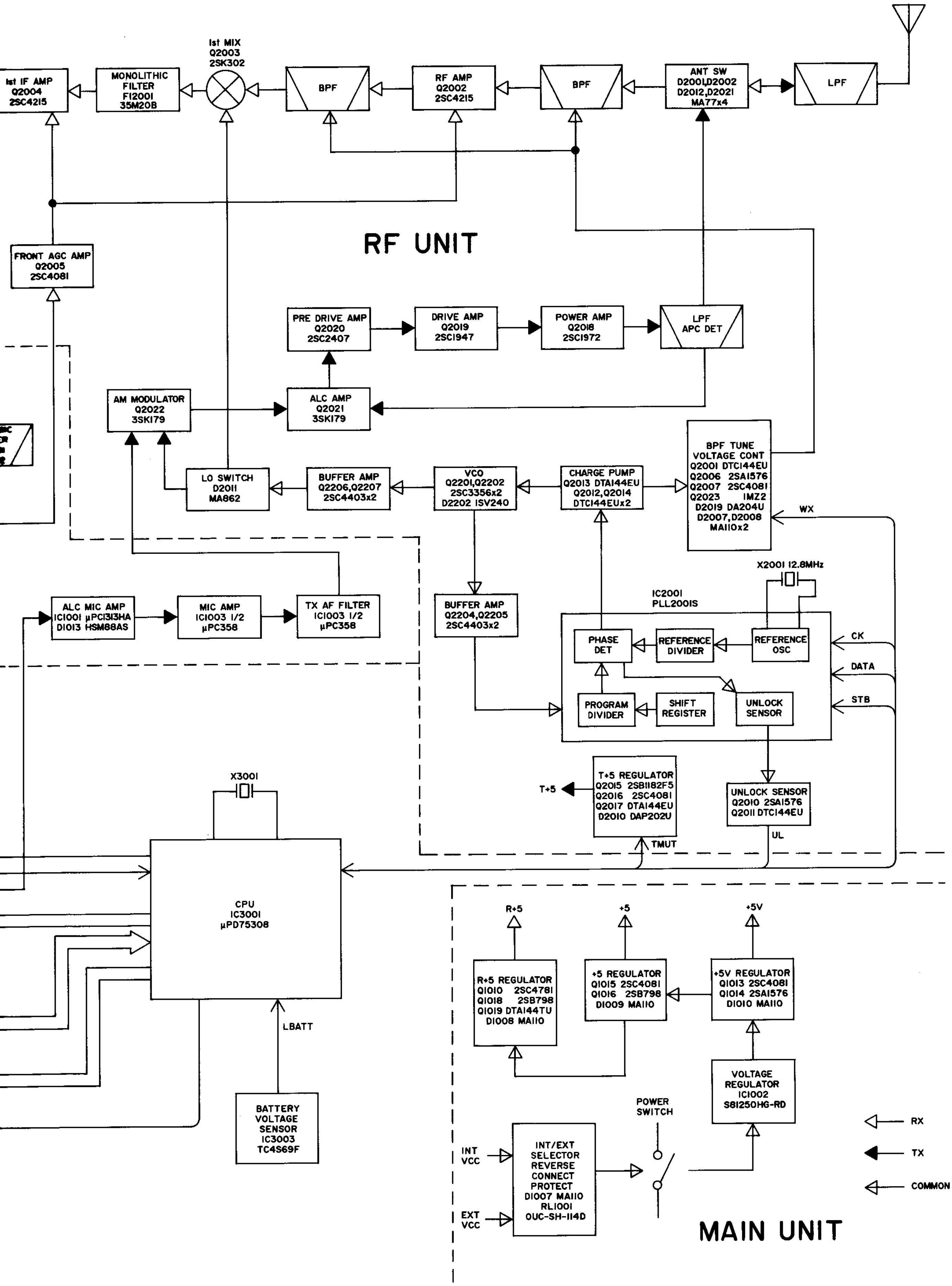


Q2203

NOTE: Add "2200" to each indicated part number on the unit for the actual part number.

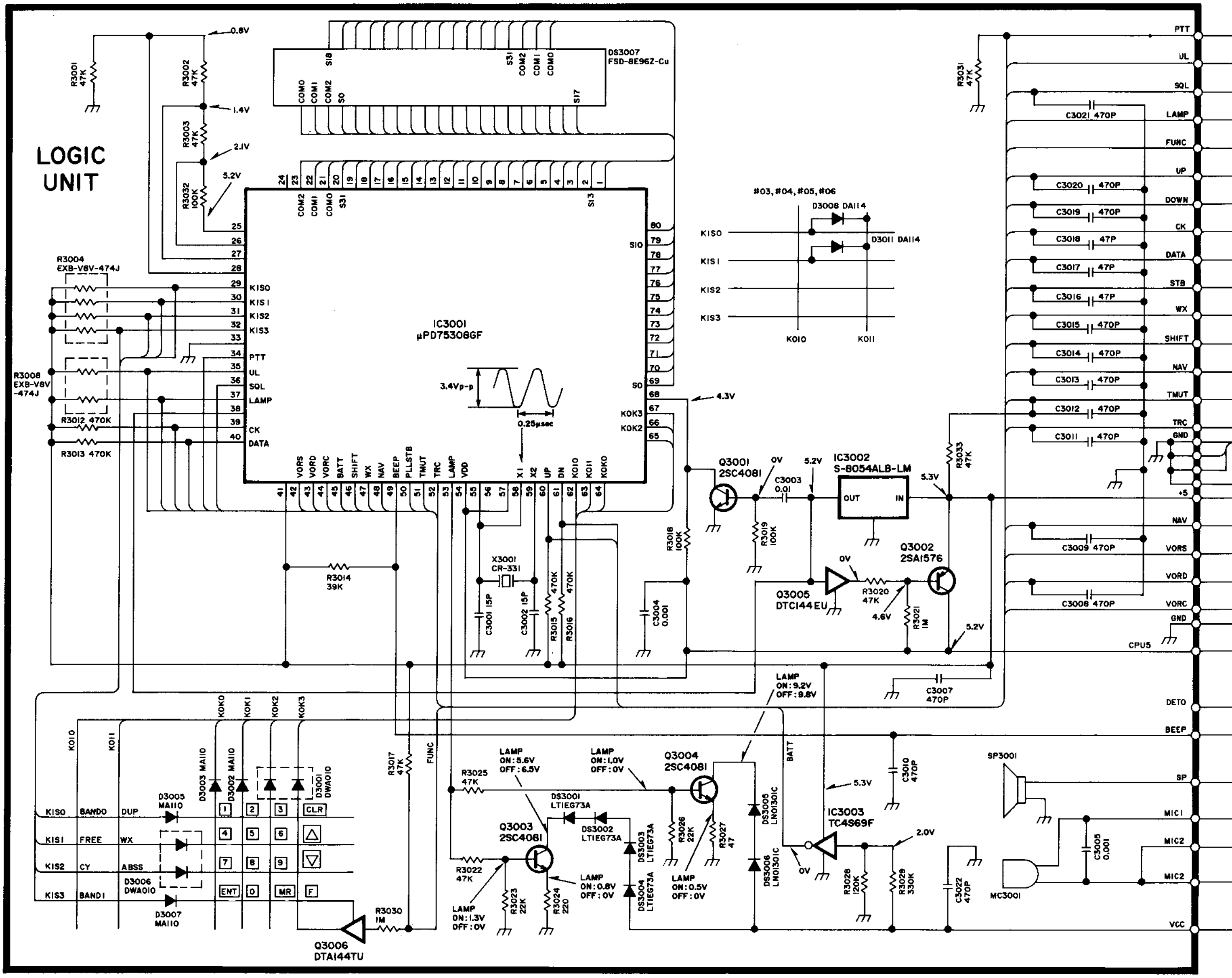
SECTION 8 BLOCK DIAGRAM

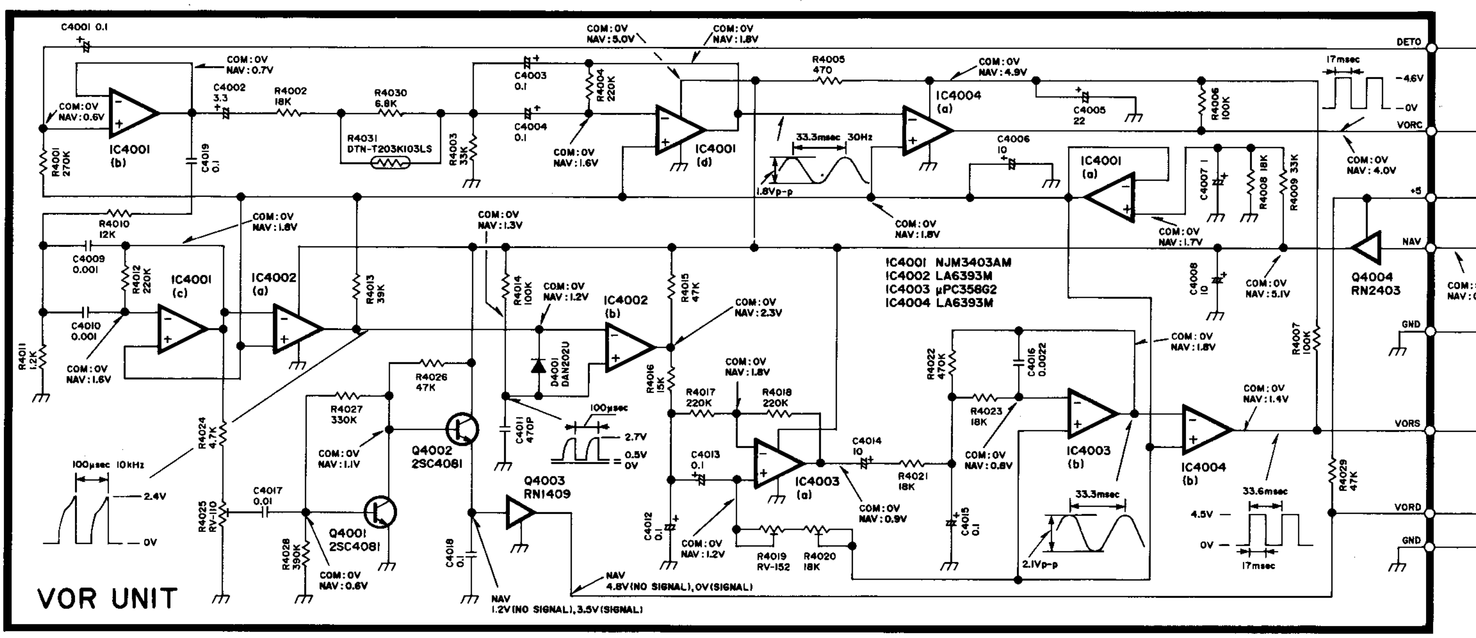


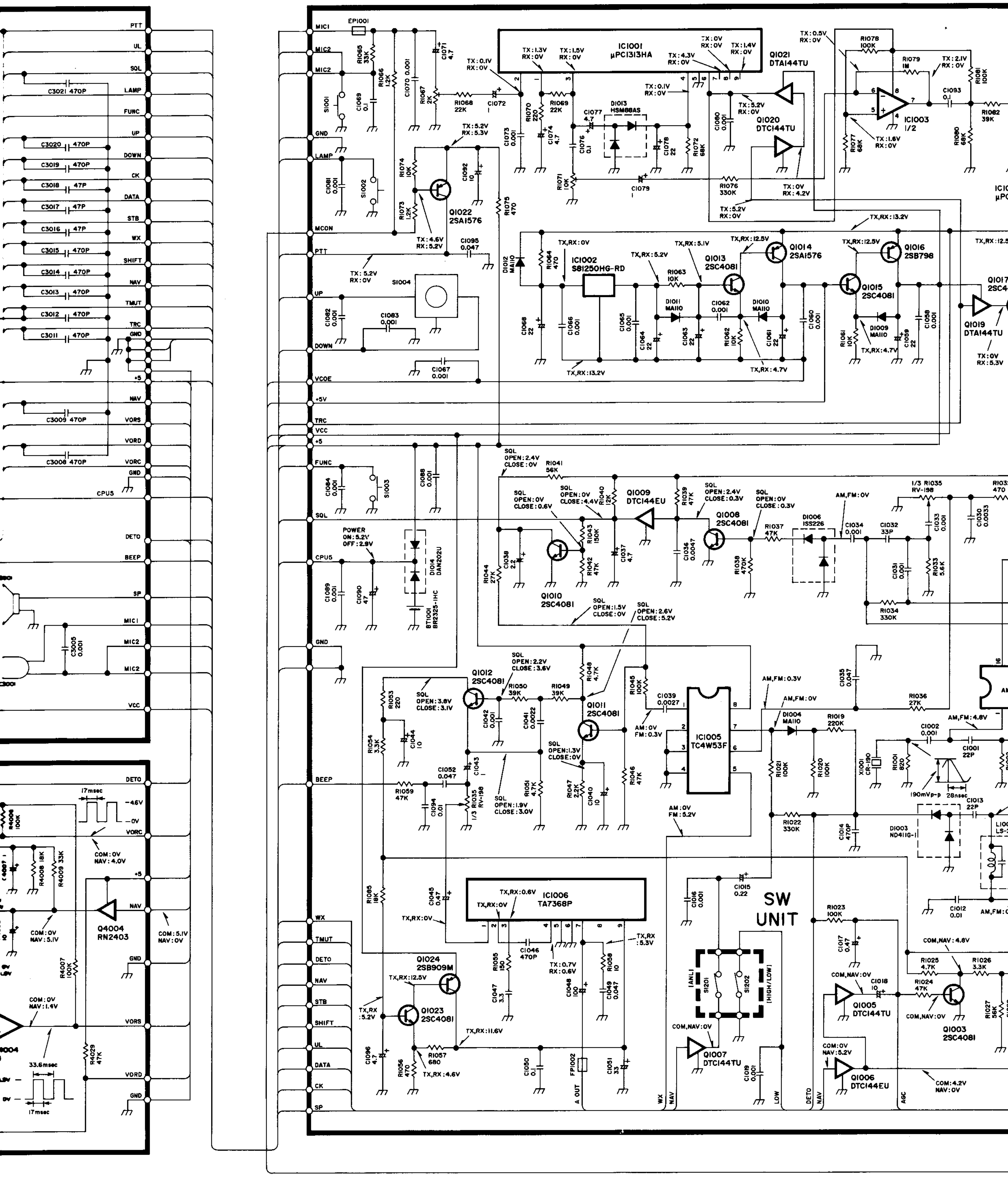


1st IF AMP Q2004 2SC4215
MONOLITHIC FILTER FI2001 35M20B
1st MIX Q2003 2SK302
BPF
RF AMP Q2002 2SC4215
BPF
ANT SW D2001,D2002 D2012,D2021 MA77x4
LPF
FRONT AGC AMP Q2005 2SC4081
RF UNIT
PRE DRIVE AMP Q2020 2SC2407
DRIVE AMP Q2019 2SC1947
POWER AMP Q2018 2SC1972
LPF APC DET
AM MODULATOR Q2022 3SK179
ALC AMP Q2021 3SK179
BPF TUNE VOLTAGE CONT Q2001 DTC144EU Q2006 2SA1576 Q2007 2SC4081 Q2023 IMZ2 D2019 DA204U D2007,D2008 MA110x2
LO SWITCH D2011 MA862
BUFFER AMP Q2206,Q2207 2SC4403x2
VCO Q2201,Q2202 2SC3356x2 D2202 ISV240
CHARGE PUMP Q2013 DTA144EU Q2012,Q2014 DTC144EUx2
WX
X2001 12.8MHz
IC2001 PLL2001S
ALC MIC AMP IC1001 µPC1313HA D1013 HSM88AS
MIC AMP IC1003 1/2 µPC358
TX AF FILTER IC1003 1/2 µPC358
BUFFER AMP Q2204,Q2205 2SC4403x2
PHASE DET
REFERENCE DIVIDER
REFERENCE OSC
CK
DATA
STB
PROGRAM DIVIDER
SHIFT REGISTER
UNLOCK SENSOR
X3001
T+5
T+5 REGULATOR Q2015 2SB1182F5 Q2016 2SC4081 Q2017 DTA144EU D2010 DAP202U
UNLOCK SENSOR Q2010 2SA1576 Q2011 DTC144EU
UL
TMUT
CPU IC3001 µPD75308
R+5
+5
+5V
R+5 REGULATOR Q1010 2SC4781 Q1018 2SB798 Q1019 DTA144TU D1008 MA110
+5 REGULATOR Q1015 2SC4081 Q1016 2SB798 D1009 MA110
+5V REGULATOR Q1013 2SC4081 Q1014 2SA1576 D1010 MA110
LBATT
VOLTAGE REGULATOR IC1002 S81250HG-RD
BATTERY VOLTAGE SENSOR IC3003 TC4S69F
POWER SWITCH
RX
TX
COMMON
INT VCC
INT/EXT SELECTOR REVERSE CONNECT PROTECT D1007 MA110 RL1001 OUC-SH-114D
EXT VCC
MAIN UNIT

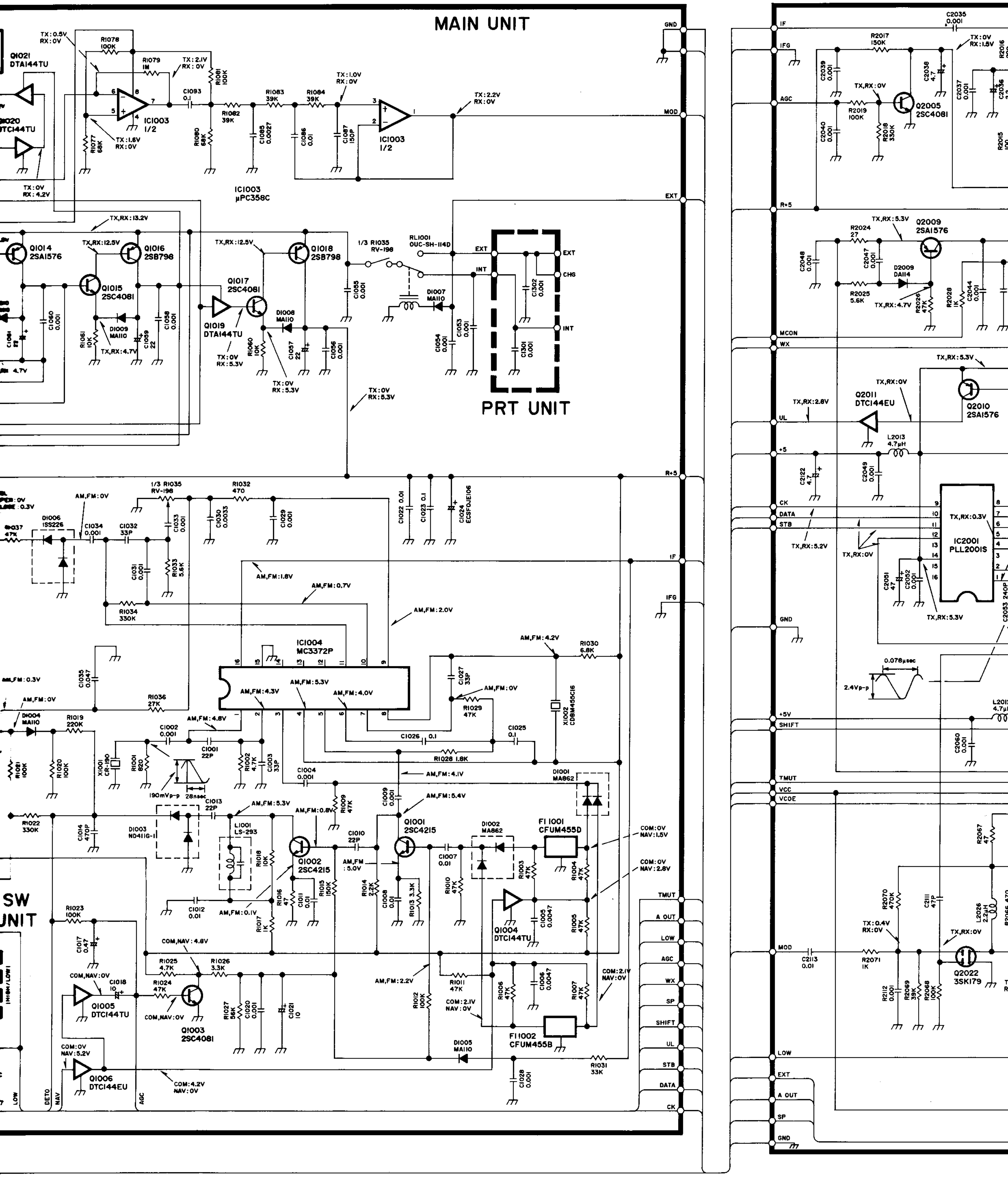
SECTION 9 VOLTAGE DIAGRAM



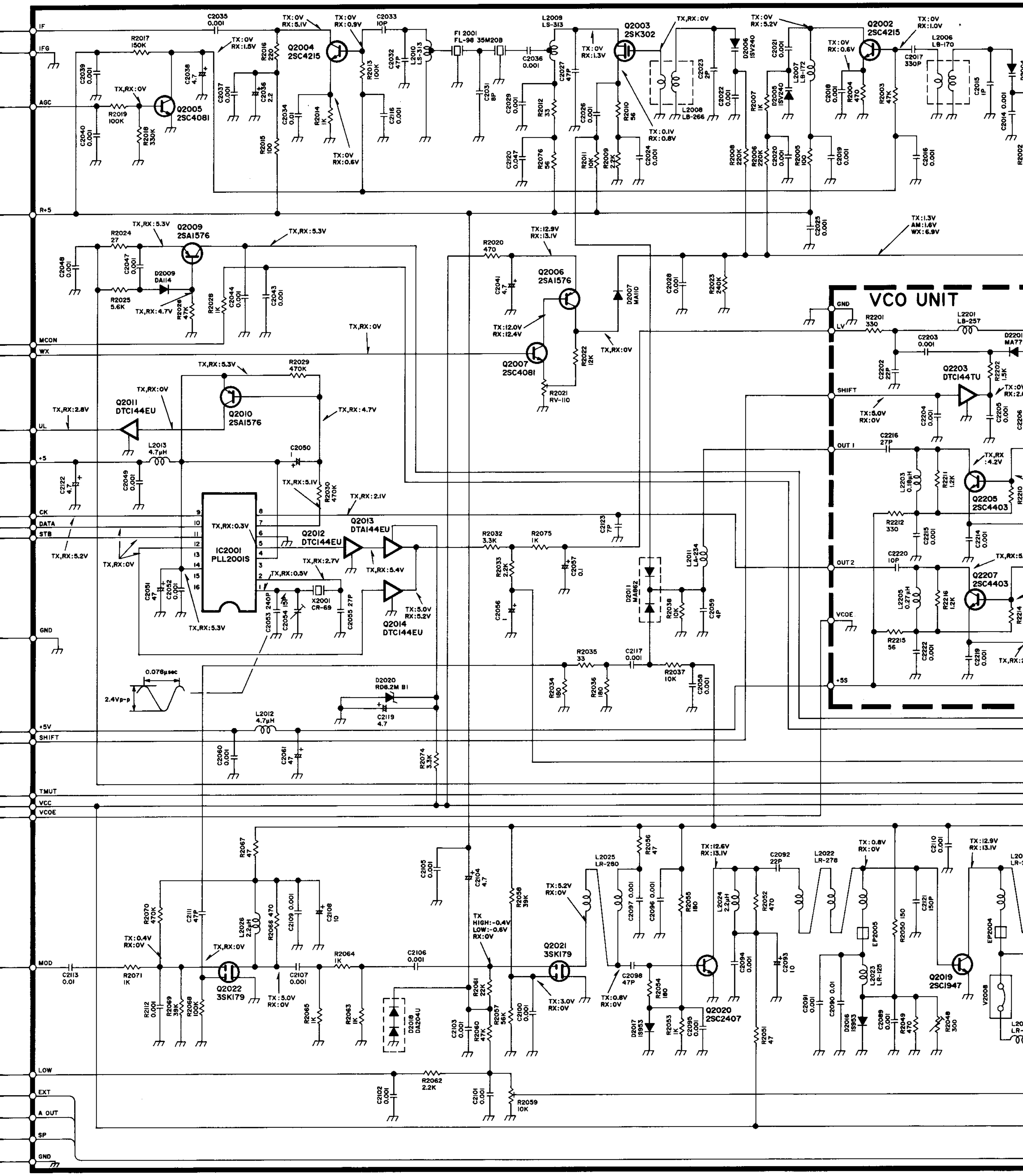


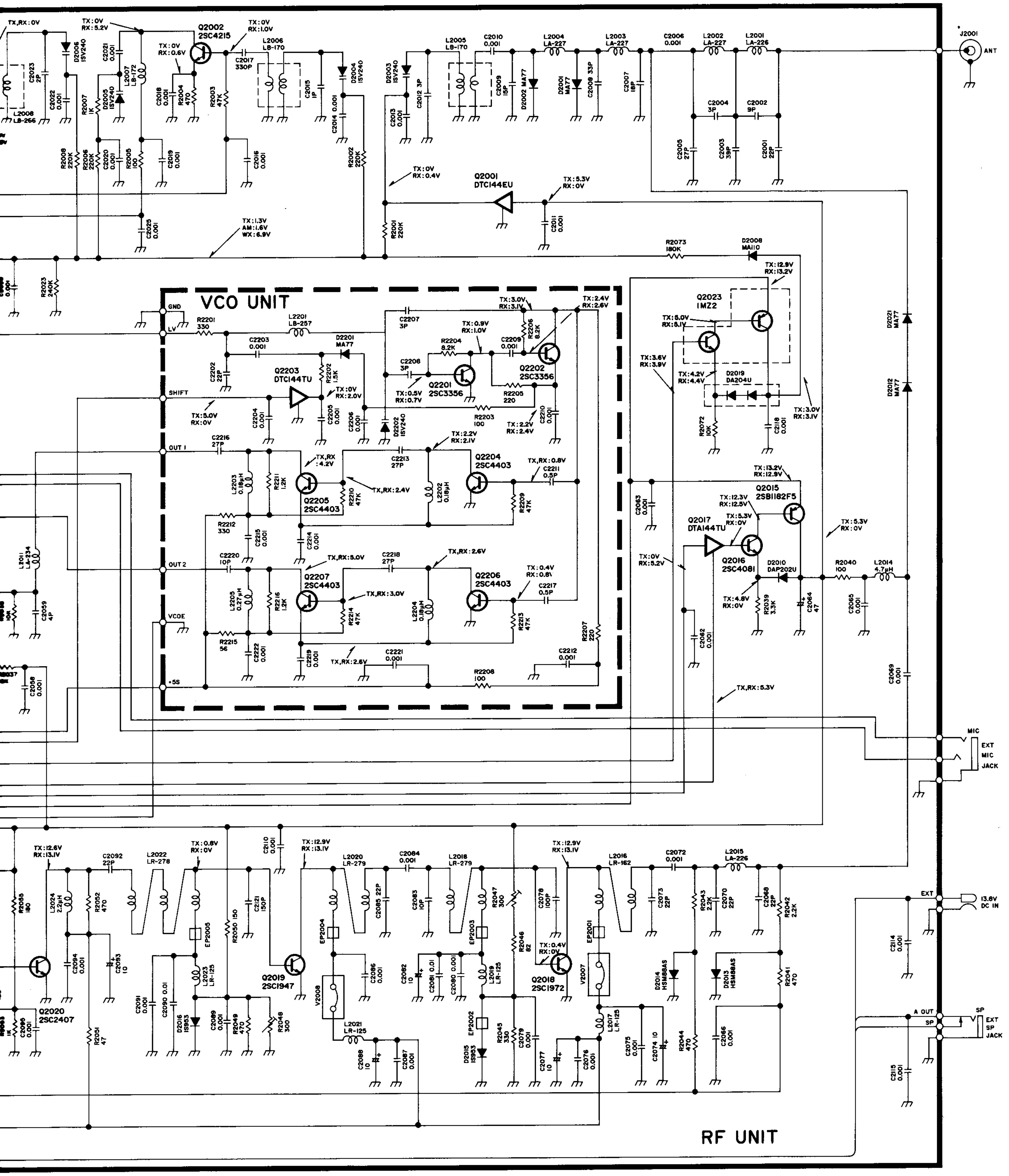


SW
UNIT
IC1001
μPC1313HA
IC1002
S81250HG-RD
IC1003
1/2
IC1005
TC4W53F
IC1006
TA7368P
Q1003
2SC4081
Q1005
DTC144TU
Q1006
DTC144EU
Q1007
DTC144TU
Q1008
2SC4081
Q1009
DTC144EU
Q1010
2SC4081
Q1011
2SC4081
Q1012
2SC4081
Q1013
2SC4081
Q1014
2SA1576
Q1015
2SC4081
Q1016
2SB798
Q1019
DTA144TU
Q1020
DTC144TU
Q1021
DTA144TU
Q1022
2SA1576
Q1023
2SC4081
Q1024
2SB909M
Q4004
RN2403
D1003
ND411G-1
D1004
MA110
D1006
1SS226
D1009
MA110
D1010
MA110
D1011
MA110
D1012
MA110
D1013
HSM88AS
D1014
DAN202U
BT1001
BR2325-1HC
X1001
CR-190
EP1001
FP1002
S1001
S1002
S1003
S1004
S1201
S1202
[ANL]
[HIGH/LOW]
MIC1
MIC2
GND
LAMP
MCON
PTT
UP
DOWN
VCOE
+5V
TRC
VCC
+5
FUNC
SQL
CPU5
BEEP
WX
TMUT
DETO
NAV
STB
SHIFT
UL
DATA
CK
SP
FUNC
CK
VORS
VORD
VORC
DETO
BEEP
A OUT
LOW
AGC
TX:5.2V
RX:0V
TX,RX:13.2V
TX,RX:12.5V
TX,RX:5.1V
TX,RX:4.7V
SQL
OPEN:2.4V
CLOSE:0V
POWER
ON:5.2V
OFF:2.9V
AM,FM:0.3V
AM,FM:0V
AM,FM:4.8V
AM:0V
FM:5.2V
COM,NAV:4.8V
COM,NAV:0V
COM:0V
NAV:5.2V
COM:4.2V
NAV:0V
COM:0V
NAV:4.0V
COM:5.1V
NAV:0V
COM:0V
NAV:1.4V
17msec
33.6msec
190mVp-p
28nsec



MAIN UNIT
PRT UNIT
SW UNIT
IC1003 μPC358C
IC1004 MC3372P
IC2001 PLL2001S
Q1001 2SC4215
Q1002 2SC4215
Q1003 2SC4081
Q1004 DTC144TU
Q1005 DTC144TU
Q1006 DTC144EU
Q1014 2SA1576
Q1015 2SC4081
Q1016 2SB798
Q1017 2SC4081
Q1018 2SB798
Q1019 DTA144TU
Q1021 DTA144TU
Q2005 2SC4081
Q2009 2SA1576
Q2010 2SA1576
Q2011 DTC144EU
Q2022 3SK179
FI1001 CFUM455D
FI1002 CFUM455B
RL1001 OUC-SH-114D
X1002 CDBM455C16


VCO UNIT
IC2001 PLL2001S
Q2001 2SC4215
Q2002 2SC4215
Q2003 2SK302
Q2004 2SC4215
Q2005 2SC4081
Q2006 2SA1576
Q2007 2SC4081
Q2009 2SA1576
Q2010 2SA1576
Q2011 DTC144EU
Q2012 DTC144EU
Q2013 DTA144EU
Q2014 DTC144EU
Q2019 2SC1947
Q2020 2SC2407
Q2021 3SK179
Q2022 3SK179
Q2203 DTC144TU
Q2205 2SC4403
Q2207 2SC4403
F12001 FL-98 35M20B
X2001 CR-69
0.078μsec
2.4Vp-p


VCO UNIT
RF UNIT
ANT
EXT MIC JACK
13.8V DC IN
EXT SP JACK

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